Torsade de Pointes caused by *Salmonella Typhi* Infection

Torsade de pointes spôsobená infekciou *Salmonella typhi*

Benavides M, Ratcliffe J, Glen C, Schweitzer P

Beth Israel Medical Center, New York, USA

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Abstract. *Background.* Torsade de pointes is a life threatening arrhythmia that is commonly a result of long QT syndromes from different causes.

Case: A 44 year-old previously healthy woman, who had recently traveled to Asia, presented to the ER complaining of high fevers, headache, constipation, and abdominal pain for one week. On the third day of hospitalization of the patient an EKG was done due to chest discomfort and showed normal sinus rhythm (NSR) with a normal QT interval. One hour later, the patient complained of worsening shortness of breath, tachypnea, and became unresponsive. The initial rhythm on the cardiac monitor revealed Torsade de Pointes. The patient was defibrillated once with 150J with conversion back to sinus rhythm. A transthoracic echocardiogram (TTE) showed LVEF of 15% with global hypokinesia. Final blood cultures grew *Salmonella typhi*. Episodes of polymorphic VT were observed until day 6. After antibiotic treatment the patient had resolution of arrhytmia with normal TTE and cardiac MRI.

This case is unique because all the common etiologies of torsade de pointes were ruled out, the EKGs before and after the event showed a NSR with normal QT intervals and absence of known causes of acquired long QT syndrome. She was diagnosed with polymorphic VT with normal repolarization, which leads us to the conclusion that the potentially fatal arrhythmia was a result of the *Salmonella typhi* bacteremia and a likely resultant myocarditis.

In our case, not only was the cardiovascular complication caused by an atypical salmonella species, but the presence of torsade de pointes in this patient is also a very rare finding.

Conclusion: The recognition of rare, although potentially serious, arrhythmic complications of a salmonella infection are important in the management of these patients. To the best of our knowledge, this is the first case of torsade de pointes resulting from a *Salmonella typhi* infection. Fig. 4, Ref. 9, Online full text (Free, PDF) www.cardiology.sk

Key words: Torsade de pointes – ventricular tachycardia – salmonella typhi – myocarditis

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Abstrakt. *Pozadie:* Torsade de pointes je život ohrozujúca arytmia, ktorá sa spája s nálezom dlhého QT syndrómu. Tento môže mať rôzne príčiny.

Prípad: 44-ročná žena, predtým zdravá, cestovala do Ázie. Pre bolesti hlavy, vysokú horúčku, zápchu a bolesti brucha počas jedného týždňa bola hospitalizovaná v nemocnici. Na tretí deň hospitalizácie sa sťažovala na bolesť na hrudníku. Pri EKG vyšetrení sa zistil normálny sínusový rytmus (NSR), s normálnym trvaním intervalu QT. O hodinu neskôr si pacientka sťažovala na zhoršenie dýchania, na tachypnoe, ktoré pretrvávalo. Registrácia EKG na monitore odhalila torsade de pointes. Pacientka defibrillovaná s 150J výbojom. Ihneď sa objavil sínusový rytmus. Transtorakálny echokardiogram (TTE) ukázal LVEF 15 % s globálnou hypokinéziou.

From [1]Beth Israel Medical Center, New York, USA and [2]Albert Einstein College of Medicine, New York, USA

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Address for correspondence: Miguel Benavides, MD, Beth Israel Medical Center, Internal Medicine Department, 1st Ave and 16th Street, New York, NY 10003, USA, e-mail: mbenavides@chpnet.org

Hemokultúry boli pozitívne na prítomnosť *Salmonella typhi*. Epizódy polymorfnej VT boli pozorované do šiesteho dňa. Po antibiotickej liečbe pacientka bola bez arytmie s normálnym nálezom TTE a MRI.
Tento prípad je jedinečný preto, že všetky známe etiológie torsade de pointes boli vylúčené. EKG pred a po udalosti ukázali normálny sínusový rytmus s normálnym trvaním QT intervalu a neprítomnosť známych príčin získaného dlhého QT intervalu. Prítomnosť polymorfnej komorovej tachykardie s normálnou repolarizáciou nás priviedla k záveru, že potenciálne smrteľná arytmia bola vyvolaná infekciou *Salmonella typhi*. Dokazuje to potvrdená bakteriémia a pravdepodobne aj následná myokarditída.
V opísanom prípade išlo o kardiovaskulárne problémy spôsobené infekciou *Salmonella typhi*. Prítomnosť torsade de pointes u tejto pacientky považujeme za veľmi vzácny nález.
Záver: Diagnostika potenciálne závažnej poruchy srdcového rytmu pri infekcii *Salmonella typhi* je veľmi významná vzhľadom na starostlivosť o pacientov so salmonelovou infekciou. Ide o prvý prípad torsade de pointes zistený pri infekcii *Salmonella typhi*. Obr. 4, Lit. 9, Online full text (Free, PDF) www.cardiology.sk
Kľúčové slová: torsade de pointes – ventrikulárna tachykardia – Salmonella typhi – myokarditída

Torsade de pointes, also referred to as polymorphic ventricular tachycardia, is a life threatening arrhythmia that is commonly a result of drugs, electrolyte imbalances, bradycardia, or congenital long QT syndromes. To the best of our knowledge, this is the first case of torsade de pointes resulting from a *Salmonella typhi* infection.

Case

A 44 year-old previously healthy woman, who had recently traveled to Bangladesh and Saudi Arabia, presented to the emergency room (ER) complaining of high fevers, measured up to 104 °F at home, headache, constipation, and abdominal pain for one week. In the ER, the patient had a temperature of 102° F with stable vital signs, but she signed out against medical advice and went home. Blood cultures were drawn before she left, and the following day the patient was contacted to return emergently to the ER owing to results showing 4 out of 4 blood culture bottles positive for gram negative bacilli organisms. Upon return to the ER, she was still febrile to102.4° F, and the rest of her vital signs showed a heart rate of 79 beats/min, blood pressure 130/69 mmHg, respiration rate 18/min, oxygen saturation 100% on room air. Initial labs revealed: White Blood Cell Count (WBC): 3 K/uL, Neutrophils 46%, Hemoglobin 9.3 g/dL, Hematocrit 27.9 %, Platelet 62 x 10^9/L. All other lab values, including electrolytes and thyroid function tests, were within normal

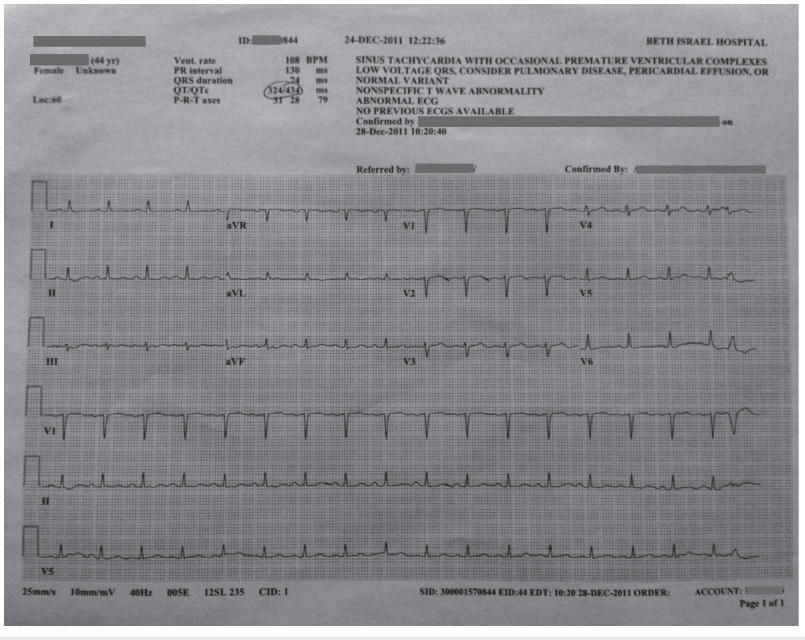


Figure 1 ECG – normal sinus rhythm with normal QT interval

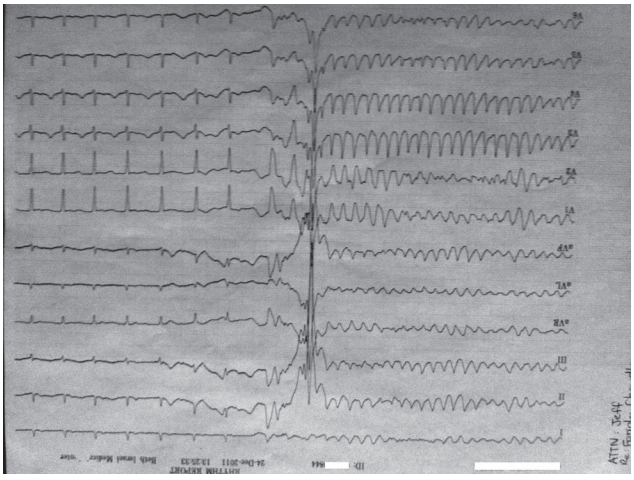


Figure 2 Torsade de pointes

limits. Urinalysis was normal. Chest x-ray (CXR) and Head CT were normal. Empiric treatment with ceftriaxone was started and the patient was admitted to a general medicine floor. The antibiotic coverage was changed to cefepime for broader coverage, given persistence of fevers and blood culture results. On the third day of hospitalization, the patient complained of chest discomfort and an EKG was done **(Figure 1)**, which showed normal sinus rhythm with a normal QT interval. One hour later, the patient complained of worsening shortness of breath, tachypnea, and eventually became unresponsive. A rapid response team was called and the initial rhythm on the cardiac monitor revealed Torsade de Pointes **(Figure 2)**. The patient was immediately defibrillated with 150J once with conversion back to sinus rhythm. Empiric magnesium IV was also given. The patient was intubated for airway protection. Electrolytes were sent and were remarkable for WBC 28.6 K/uL, Troponin I: 2.510 ng/mL, BNP 440 pg/mL and Potassium (K) 2.8 mmol/L, which was aggressively repleted. Magnesium level was normal. Repeat CXR showed bilateral parenchyma opacities, and the antibiotic regimen was changed to Imipenem with the addition of Vancomycin. The patient continued to have multiple runs of polymorphic ventricular tachycardia that would self-terminate. EKG still revealed sinus rhythm with normal QT intervals **(Figure 3)**. An Amiodarone drip was started and magnesium and potassium levels were closely monitored but remained normal throughout the rest of the hospitalization. Within 12 hours of the event, a transthoracic echocardiogram was performed and showed a left ventricular ejection fraction (LVEF) of 15% with global hypokinesis. Final blood cultures grew *Salmonella typhi* **(Figure 4)**. Supportive care and antibiotics were continued in the intensive care setting. Episodes of polymorphic VT were observed until day 6 when the rhythm became more regular. The patient clinically improved and was eventually extubated with intact neurological status on day 6. A repeat transthoracic echocardiogram on day 11 showed an improved LVEF of 55% without wall motion abnormalities. Amiodarone was initially discontinued, but the patient had short runs of ventricular tachycardia, and amiodarone PO was resumed. A Cardiac MRI on day 16 found no significant pathology. The patient was discharged home and was followed up as an outpatient.

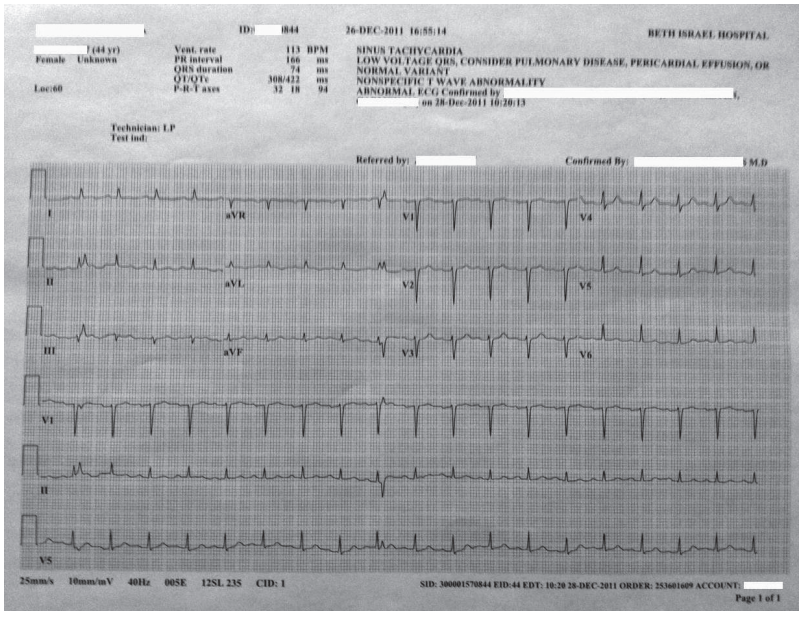
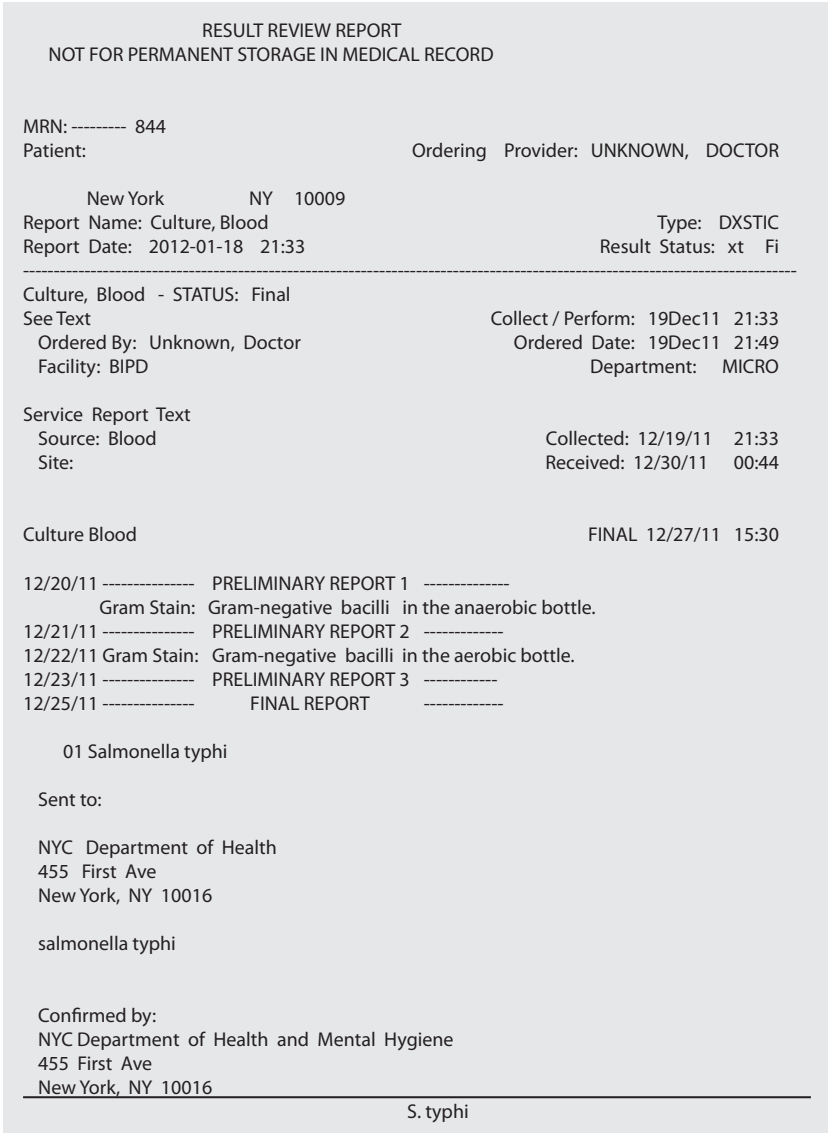


Figure 3 Ventricular tachycardia



RESULT REVIEW REPORT
NOT FOR PERMANENT STORAGE IN MEDICAL RECORD

MRN: --------- 844
Patient: Ordering Provider: UNKNOWN, DOCTOR

New York NY 10009
Report Name: Culture, Blood Type: DXSTIC
Report Date: 2012-01-18 21:33 Result Status: xt Fi

Culture, Blood - STATUS: Final
See Text Collect / Perform: 19Dec11 21:33
Ordered By: Unknown, Doctor Ordered Date: 19Dec11 21:49
Facility: BIPD Department: MICRO

Service Report Text
Source: Blood Collected: 12/19/11 21:33
Site: Received: 12/30/11 00:44

Culture Blood FINAL 12/27/11 15:30

12/20/11 ---------- PRELIMINARY REPORT 1 ----------
Gram Stain: Gram-negative bacilli in the anaerobic bottle.
12/21/11 ---------- PRELIMINARY REPORT 2 ----------
12/22/11 Gram Stain: Gram-negative bacilli in the aerobic bottle.
12/23/11 ---------- PRELIMINARY REPORT 3 ----------
12/25/11 ---------- FINAL REPORT ----------

01 Salmonella typhi

Sent to:

NYC Department of Health
455 First Ave
New York, NY 10016

salmonella typhi

Confirmed by:
NYC Department of Health and Mental Hygiene
455 First Ave
New York, NY 10016

S. typhi

Figure 4 Blood cultures with *Salmonella typhi*

After 3 months, the patient is doing well, off all medications, and without arrhythmic events, on home monitoring.

Discussion

Torsade de pointes is a wide complex tachycardia at rates usually greater than 200 beats/min in which the QRS morphology is variable (1). The pattern gives a characteristic appearance where the QRS complexes are twisting about the baseline – hence the name torsade de pointes, or "twisting of the points". This arrhythmia is frequently encountered in the setting of acquired long QT syndromes due to abnormal repolarization secondary to drugs, electrolyte imbalance, or bradyarrhythmias (2). Myocarditis can also delay repolarization and prolong the QT interval resulting in torsade de pointes. However, this arrhythmia may also occur in patients with a normal QT interval, but this is usually seen in patients with structural heart disease, particularly acute myocardial infarctions or cardiomyopathies (2). Horowitz et al. (3) postulated that, in the absence of transient factors known to prolong the QT interval, torsade de pointes may be a rapid reentrant tachyarrhythmia with electrophysiologic characteristics of both typical ventricular tachycardia and ventricular fibrillation.

In the present case, the common etiologies of torsade de pointes were ruled out. The EKG before and after the event

showed a normal heart rate with normal QT intervals, nor was the patient on any medications that would predispose to this arrhythmia. The patient was hypokalemic initially but, after correction to normal potassium levels, the patient continued to have runs of polymorphic VT without any change in QT interval. Given the persistence of a normal QT interval and the absence of known causes of acquired long QT syndrome, the patient was diagnosed with polymorphic VT with normal repolarization. The patient's clinical presentation is not consistent with an acute MI, which is the usual cause of polymorphic VT with normal QT, which leads us to conclude that the potentially fatal arrhythmia was a result of the *Salmonella typhi* bacteremia and a likely resultant myocarditis.

Typhoid fever is a potentially fatal multisystemic disease that is caused by the organism *Salmonella typhi*. In the US, approximately 400 cases of Typhoid fever are diagnosed per year (4), most of the time acquired by travelers to countries where typhoid fever is endemic. The classic symptoms are fever, abdominal pain, and constipation while cardiac involvement is extremely rare and thought to occur in less than 5% of all salmonella bacteremias (5). Potential cardiovascular complications include endocarditis, infected atheroma or aneurysms, myocarditis, and pericarditis, although these have been more associated with the non-typhoidal species such as *salmonella enteritidis* (6 – 8). Furthermore, only a few cases have reported ventricular arrhythmias associated with salmonella infection (6, 9). Hibbert et al. (6) reported a case of a 25 year old male who had ventricular fibrillation and was found to have *Salmonella enteritidis* myocarditis and was treated with antibiotics and amiodarone without recurrence of arrhythmia. In our case, not only was the cardiovascular complication caused by an atypical salmonella species, but the presence of torsade de pointes in this patient is also a very rare finding.

Conclusion

The recognition of rare, although potentially serious, arrhythmic complications of a salmonella infection are important in the management of these patients.

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