Infect Dis Trop Med 2018; 4 (2): e466

A misleading case of sepsis and severe soft tissue infection due to a peculiar community-acquired MRSA infection

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ABSTRACT:

Introduction: Methicillin-resistant *S. aureus* (MRSA) is one of the major causes of nosocomial infections worldwide and the prevalence of MRSA in Italy is one of the highest in Europe. More recently MRSA has also emerged as an agent of community invasive infections. CA-MRSA (community associated MRSA) has a typical antibiotics susceptibility pattern and it is responsible for skin and soft tissues infections, especially in young healthy individuals. In the reported case, a 17 years-old boy, without any previous contacts with healthcare facilities, developed sepsis with functional impairment of right leg after an intramuscular injection received at home. MRSA not susceptible to clindamycin and erythromycin was isolated from blood cultures. Despite adequate antibiotic therapy, the patient still complained of leg dysfunction and pain. Several imaging investigations were performed but only a pelvic magnetic resonance was able to show an acute sacrum-ileitis, with a voluminous abscess between ileus-psoas muscle and right emi-sacrum. The patient experienced clinical improvement only after the combination of the abscess' drainage with adequate antibiotic therapy. Our patient developed a serious infection caused by a peculiar community-acquired MRSA, in absence of clear risk factors. For this reason, in absence of clinical response to antibiotic therapy, it's mandatory to suspect a multi-resistance bacterial infection in order to begin as quickly as possible the most appropriate therapy and improve prognosis.

Keywords: Community-acquired MRSA, Pelvic pyomyositis.

BACKGROUND

Shortly after the introduction of beta-lactam antibiotics, the prevalence of methicillin-resistant *S. aureus* (MRSA) progressively increased in healthcare settings, becoming one of the major causes of nosocomial infection. In Italy, nosocomial MRSA prevalence among all *S. aureus* isolates is 35-40%[1], while mean MRSA prevalence in Europe is about 16%[2]. More recently, MRSA has emerged as an agent of invasive infections in patients without previous contacts with healthcare facilities, becoming a therapeutic concern worldwide[3,4]. Therefore, on the basis of the clinical and molecular epidemiology, MRSA isolates can be categorized in healthcare-associated methicillin-resistant *S. aureus* (HA-MRSA) and community-associated methicillin-resistant *S. aureus* (CA-MRSA). CA-MRSA differs from HA-MRSA for antibiotics susceptibility patterns, being CA-MRSA usually susceptible to erythromycin and clindamycin[5,6]. It is typically responsible for skin and soft tissues infections in young healthy individuals without predisposing risk factors for MRSA acquisition and without previous contacts with healthcare facilities, causing outbreaks especially among athletes[7]. Sporadically, CA-MRSA is involved in serious life-threatening infections, such as necrotizing pneumonia, necrotizing fascitis, sepsis and osteomyelitis. CA-MRSA strains related to a severe evolution of the infections are typically

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associated with the production of the Panton-Valentine leukocidin (PVL)[8]. Here we report a case of sepsis originated from soft tissue infection in a young healthy man without history of previous contact with healthcare facilities, caused by a community-acquired MRSA with a peculiar susceptibility profile.

CASE REPORT

A healthy 17 years-old boy, with no previous history of hospitalization or contacts with healthcare facilities, reported the onset, during sport activity, of pain in the right-sided gluteus region, with sciatic nerve irradiation, associated with strength loss, stypsis and transitory urine retention. He received an intramuscular injection of tiocolchicoside at home and then developed fever. At the admission to a peripheral Hospital, his body temperature was 40°C and he complained severe back pain; blood exams showed leukocytosis and elevated inflammatory indexes (CRP 134 mg/L, nv < 2.90 mg/L). Blood cultures were collected and antibiotic therapy with piperacillin/tazobactam (4.5 g tid) was started, without clinical improvement in the following days. A urinary catheter was positioned for urinary bladder over distension. Suspecting a traumatic fracture with consequent nerve involvement, the patient underwent a pelvis X-ray and a lumbosacral spine X-ray, which were normal. An abdomen/pelvis CT scan, a lumbosacral spine magnetic resonance (MRI) and a gluteus region ultrasound were performed in order to investigate the origin of fever and pain, however no abnormalities were found.

Microrganismi isolati		*Carica microbica*
1 Staphylococcus aureus		
	Isolato 1	
ANTIBIOTICI	*MIC mcg/ml*	
ACIDO FUSIDICO	<=0,5	S
AMOXICILLINA/CLAVULANICO		R
AMPICILLINA		R
CEFALEXIN		R
CEFOTAXIME		R
CEFOXITIN SCREEN	Pos	+
CEFUROXIME		R
CLINDAMICINA		R
DAPTOMYCIN	0,25	S
ERITROMICINA	>=8	R
GENTAMICINA	<=0,5	S
LEVOFLOXACINA	<=0,12	S
LINEZOLID	2	S
OXACILLINA MIC	>=4	R
PENICILLINA G	>=0,5	R
RIFAMPICINA	<=0,03	S
TEICOPLANINA	<=0,5	S
TETRACICLINA	>=16	R
TIGECYCLINE	<=0,12	S
TRIMETHOPRIM/SULFAMETOSSAZOL	<=10	S
VANCOMICINA	1	S

Figure 1. Bacteria isolated from blood culture and from abscess specimen.

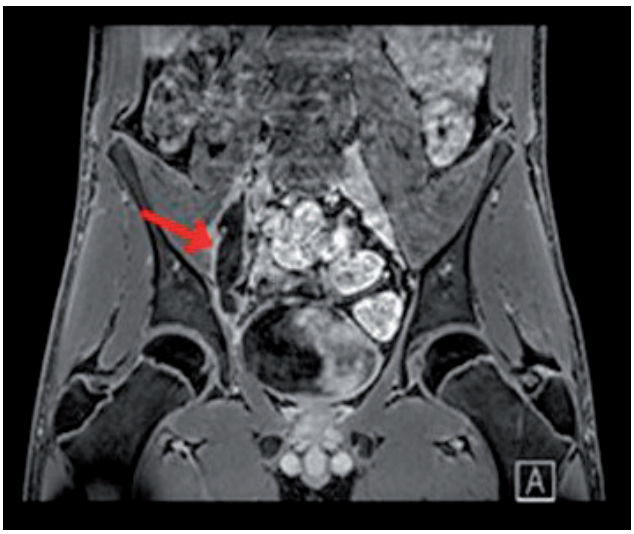

Figure 2. Pelvic MRI (VIBE sequence coronal reconstruction after cotrast medium) showing abscess between ileo-psoas and right emi-sacrum *(red arrow).*

After 48 hours MRSA not susceptible to clindamycin and erythromycin was isolated from blood cultures (Figure 1), so antibiotic therapy was switched to intravenous vancomycin (2 g/die administered by continuous infusion). A transthoracic echocardiography and a fundus oculi examination were performed to complete the diagnostic work-up, resulting both normal. The neurologist evaluated the patient for the transitory episode of stypsis and urine retention and suggested cerebrospinal fluid (CSF) examination and electromyography (EMG) to exclude a myelitic involvement. CSF examination did not show abnormalities. In particular, Link Index was normal and research of oligoclonal bands resulted negative. EMG did not find anomalies. During vancomycin treatment there was a progressive defervescence, but the patient developed an allergic rash, so the therapy was switched to daptomycin (6 mg/kg/qd) and rifampicin per os (600 mg qd). Despite an improvement in biochemical parameters and a normalization of body temperature, pain and functional impairment of right leg persisted. For this reason, pelvic MRI was performed, finally showing an acute sacrum-ileitis, with a voluminous abscess (4 x 2 x 9 cm) between ileus-psoas muscle and right emi-sacrum (Figures 2 and 3). The abscess was drained and culture of the drained material resulted positive

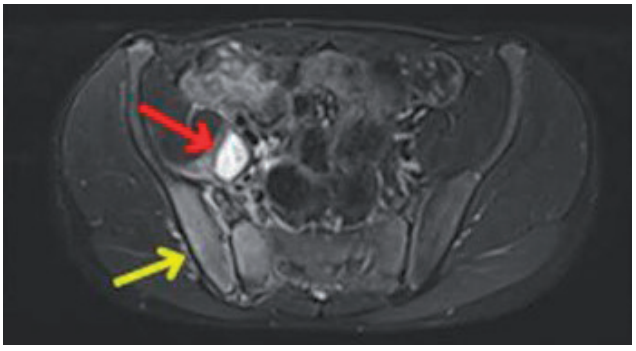

Figure 3. Pelvic MRI (fat sat axial before contrast medium) showing abscess between ileo-psoas muscle and right emi-sacrum *(red arrow)* and sacrum-ileitis *(yellow arrow).*

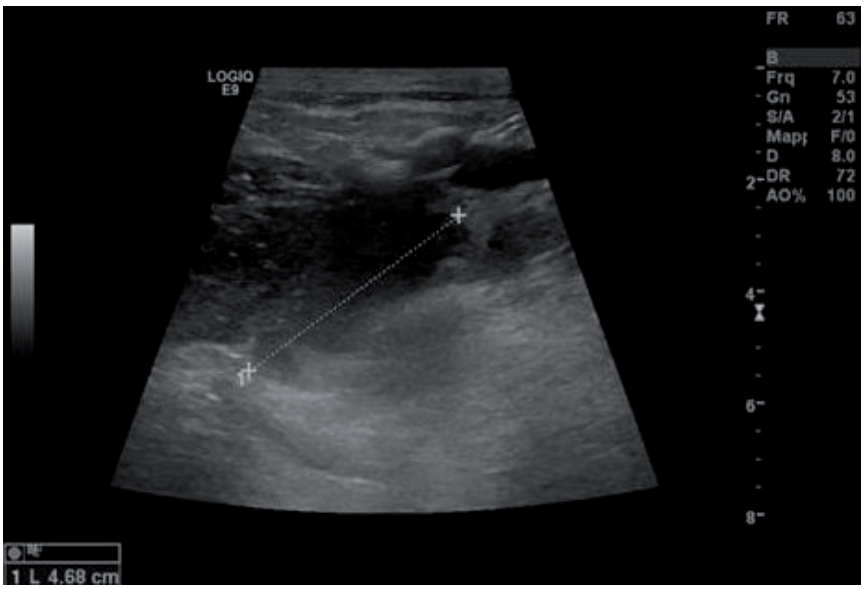

Figure 4. US image of gluteus muscle showing significant reduction of the abscess'volume after echographic-guided drainage and antibiotic therapy.

for MRSA, with the same resistance profile of the former blood isolate. After three weeks of intravenous antibiotic therapy, the patient underwent a further ultrasound (US) examination, which showed a significant improvement with dimensional decrease of the abscess (Figure 4). The patient was discharged in good clinical condition on oral therapy (rifampicin 600 mg qd and levofloxacin 750 mg qd). After the introduction of levofloxacin, he presented a further allergic reaction with rash and facial edema. Levofloxacin was substituted with cotrimoxazole (160/800 mg bid), which was well tolerated. After eight weeks of antibiotic therapy, there was a complete radiologic resolution of the abscess. Antibiotic therapy was therefore interrupted and the patient is currently healthy with complete recovery of right-leg function.

DISCUSSION

This case had a lot of peculiarities, which represented a challenge in clinical management. As known, CA-MRSA is commonly implicated in skin and soft tissues infection and causes disease especially in young and healthy patients without previous contacts with healthcare facilities[7]. Of contrary, our patient developed an infection by a MRSA with a hospital pattern of antibiotic susceptibility. The only risk factor we identified was an intramuscular injection made at home by a relative, which also denied contacts with any hospital. For this reason, we considered the strain as a CA-MRSA even if it had a peculiar pattern of antibiotic susceptibility. Excluding a nosocomial infection acquired after hospital admission, another possible explanation for the development of the invasive disease is a previous colonization by a CA-MRSA. *S. aureus* is a common commensal of the upper respiratory tract in children and adolescents. In Italy up to 50% of young people are colonized by strains usually susceptible to methicillin[9]. Literature data show that *S. aureus* invasive disease occurs more frequently in patients that are nasal carriers[10]. Decolonization is not recommended in healthy carriers unless of specific conditions (i.e. before cardiac surgery) and the antibiotic of choice is mupirocin, with or without chlorhexidine[11]. French authors however suggest that decolonization (mupirocin with or without clorexidine) could be useful in grouped cases of community acquired soft tissue infection of CA-MRSA to prevent the spread of the cases[12]. Unfortunately, nasal swabs were not performed in our patient and his parents, but it could have been useful to clarify the origin of infection.

Another point of discussion is the most adequate iter to diagnose deep abscess: pyomyositis of the pelvic musculature is a rare condition and most of the cases described are characterized by a delay of diagnosis[13,14]. Our case was initially interpreted and treated as a sepsis without localization: soft tissues US and TC scan did not identify the abscess between ileus-psoas muscle and right emi-sacrum and only MRI allowed the right diagnosis. Current guidelines indicate MRI as the exam of choice for the identification of deep muscular infections[15]. If MRI cannot be performed, a CT scan can be useful, but its diagnostic accuracy is lower. US is helpful only if the infected muscle groups are superficial[16].

Even if we started an antibiotic therapy focused on the isolate from blood colture, there wasn't a substantial and rapid improvement in the patient's clinical conditions. It's known that antibiotic penetration in abscesses is scarce as there is an insufficient vascular carriage. The penetration of an antibiotic into an encapsulated purulent lesion is limited and highly dependent on the degree of the abscess maturation. Moreover, although substantial antibiotic concentrations can be reached within abscesses, the efficacy may be hampered by various factors like low pH, protein binding and degradation by bacterial enzymes[17]. For this reason, the therapeutic approach to abscess can't rely only on antibiotic therapy. Accordingly to recent guidelines, the first line treatment is percutaneous or surgical drainage of the abscess supported by broad-spectrum antibiotic therapy active on *S. aureus*[18]. CT-guided percutaneous catheter drainage is a safe and effective treatment of profound abscesses, while surgery should be reserved for cases of failure of percutaneous drainage, or in pre-

sence of contraindications, or when abscesses are related to an intra-abdominal disease process which also requires open surgical intervention[19].

Another challenging point of our case is that the patient presented hypersensitivity to different antibiotics and, in particular, he developed and allergic rash to vancomycin, which required a second line intravenous therapy. Especially levofloxacin hypersensitivity made the management of oral therapy challenging. Allergic reaction to non-beta lactams antibiotics are not well studied but some authors describes prevalence of 1-3% in general population. In particular, hypersensitivity to vancomycin is rare, but allergies to quinolones are more common, accounting for the second cause of hypersensitivity reactions after beta lactams[20,21]. Nowadays the development of different antibiotic classes active against MRSA allows an antibiotic treatment focused on the patient characteristic with good performances also in severe infections[22].

CONCLUSIONS

Hospitalization is the main risk factor for MRSA acquisition. In the reported case, the patient developed sepsis caused by MRSA without any contact with healthcare facilities and the only recognised risk factor for invasive infection was the intramuscular injection that the patient received at home. CA-MRSA are typically isolated in young patients and causes soft tissues and skin infections, as the case we describe above. CA-MRSA are resistant to methicillin, but they are normally susceptible to clindamycin and erythromycin. Conversely, the bacteria responsible of our patient's infection had a peculiar spectrum of resistance. We don't have any indication to suspect that the patient acquired the infection in a healthcare structure, so we must consider this *S. aureus* as a CA-MRSA. The patient had a clinical improvement only after the combination of the abscess' drainage and an adequate antibiotic therapy.

In absence of clinical response to antibiotic therapy, it's mandatory to suspect a multi-resistance bacterial infection even in patients coming from home, in order to begin as quickly as possible the most appropriate therapy, and to evaluate the possibility of a deep focus of the infection.

This case has been previously presented as abstract at IBAT congress, Napoli 2017

Conflict of Interest:
The Authors declare that they have no conflict of interests.

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