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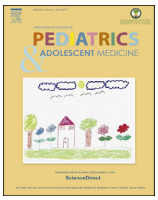

Invasive community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA) infection in children: Case series and literature review

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ABSTRACT

The majority of CA-MRSA infections present as skin and soft tissue infections such as abscesses or cellulitis. However, CA-MRSA can cause invasive infections such as joint infections, necrotizing pneumonia or septicemia. Here we describe five cases with CA-MRSA bacteremia complicated with osteoarticular infection, necrotizing pneumonia, and infective endocarditis. We report these case series to outline the spectrum of invasive CA-MRSA diseases and to demonstrate clinical outcome. Early proper intervention with regular revisiting the empirical treatment based on local susceptibility data is crucial. More data on the risk factors for acquiring and spread of CA-MRSA in children are required.

1. Introduction

Community acquired methicillin resistant *Staphylococcus aureus* (CA-MRSA) infection in pediatrics is a growing issue global [1,2]. In Saudi Arabia, CA-MRSA assessed in one retrospective study in Outpatient children at a university hospital from 2005 to 2008; they observed that 29.8% of clinical *S. aureus* isolates were CA-MRSA, of these cases, 64.7% not associated with known risk factors [3]. A recent prospective study in 2015 done by F. Alaklobi et al. reported that the rate of MRSA carriage between children in Riyadh province was within the range reported internationally (23.2%) [4]. The data from the United States report that MRSA represents up to 76% of all group obtained *Staphylococcus aureus* separates in some pediatric focuses [5]. Current reports depict progressively serious infection on account of CA-MRSA with proposals that CA-MRSA may bring about more extreme disease than group gained methicillin sensitive *Staphylococcus aureus* (CA-MSSA) [1,2,6]. Most CA-MRSA strains contain the harmfulness factor consider Panton-Valentine leukocidin (PVL) [7]. Rates of invasive MRSA infections in children remain remarkably lower than what has reported in adults. However, rates among the children increased about 10% per year since 2005 [8]. As of late, there have been reports of obtrusive CA-MRSA tainting pediatrics without hazard variables, with confined instances of life-debilitating illness (1). MRSA bacteremia can associate with metastatic sites of infection such as endocarditis, osteomyelitis, epidural or psoas abscesses with associated mortality reach 30% [9], (2); also CA-MRSA can cause severe necrotizing pneumonia in young, immunocompetent patients [10]. We report these case series to outline the spectrum of invasive CA-MRSA diseases and to demonstrate clinical outcome in five cases had invasive disease was described Table 1.

2. Cases

2.1. Case 1

A five-year-old boy, presented with a history of fever and left hip pain with inability to bear weight for two weeks duration blood culture grew CA-MRSA based on susceptibility. MRI showed bone and joint changes suggestive of osteoarticular infection and gluteal abscess. Treated initially with Teicoplanin where blood sterilized, then shifted to clindamycin and rifampin to enhance local improvement, incision and drainage were done twice to evacuate the re-collected pus at the gluteal region. Initial workup revealed

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Table 1
Clinical characteristics of cases has invasive infection with CA-MRSA strains.

	Gender	Origin	Infection site	Risk factor	Treatment	Complication	Outcome
5 years	Male	Saudi	Blood stream infection/Left femur osteomyelitis/gluteal abscess	No	IV piperacillin-tazobactam + IV cloxacillin x 4 days then Teicoplanin x 10 days. IV Clindamycin + IV Rifampicin x 4 weeks + Irrigation and debridement PO Clindamycin x 2 weeks	No	Good
3 years	Male	Saudi	Blood stream infection/infective endocarditis	No	IV Vancomycin x 6 weeks IV Gentamicin + IV Rifampicin x 2 weeks	No	Good
10 years	Male	Saudi	Blood stream infection/Right hip septic arthritis	No	IV Vancomycin x PO Clindamycin	No	Good
4 years	Female	Saudi	Blood stream infection/Right hip septic arthritis/lung abscess/infective endocarditis	CVC for TPN	Piperacillin - tazobactam and vancomycin (Empirical) IV Gentamicin IV Clindamycin Enoxaparin sodium Aspiration plus arthrotomy and debridement	No	Good
2 years	Male	Saudi	Blood stream infection/left knee septic arthritis/Left femur osteomyelitis	No	IV Vancomycin x 6 weeks	No	Good

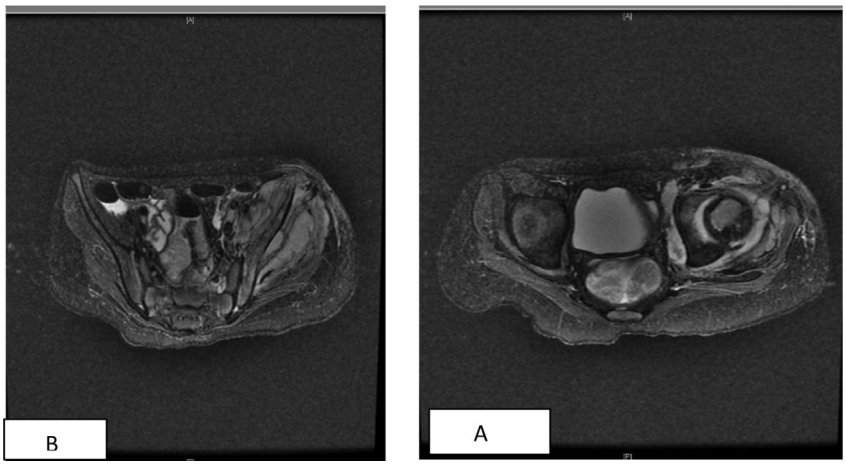

Fig. 1. Bilateral hip MRI showed Soft tissue thickening and edema with mild enhancement at the left hip joint extending to the right hemi-pelvic muscle in keeping with residual infection/partially treated osteomyelitis **A**. Small collections seen at antro-lateral aspect of left femoral head measuring 1 × 0.7 cm. **B**. Small collection at left sub gluteus region measuring 1.3 × 6 cm.

blood white cell count was 10 × 10^9/L, the erythrocyte sedimentation rate (ESR) 120 mm/h. Clinical improvement was lacking for two weeks, and repeated MRI showed soft tissue thickening with enhancement in keeping with partially treated osteomyelitis, anterolateral of the femoral head and subgluteal region collection with mild lateral subluxation of the femoral head was noted (Fig. 1A and B). After one month of continuous intravenous therapy, the patient showed marked clinical improvement. Moreover, inflammatory markers were going down accordingly. Medications were step-down to oral clindamycin, and complete clinical improvement and radiological resolution were noted at three months follow-up.

2.2. Case 2

A three-year-old boy, presented with prolonged fever and decreased activity, with no clear focus, blood culture revealed MRSA which only resistant to clindamycin. Vancomycin initiated initially, but with no level adjustment. Fever continued with continuing bacteremia, laboratory workup showed that a white blood cell count of 8.3 × 10^9/L, hemoglobin 7.5 g/dL, and a platelet count of 226 × 10^9/L, erythrocyte sedimentation rate (ESR) 42 mm/h, The serum C-reactive protein (CRP) level was 3.2 mg/dL (normal, <0.5 mg/dL). A chest radiograph was unremarkable, while Transthoracic echocardiography disclosed mild tricuspid regurgitation, normal LV function, and vegetation found on the right ventricle: at the tricuspid valve with a size of 11.1 × 8.2 mm (Fig. 2). So MRSA native valve infective endocarditis verified, where vancomycin level adjusted as treating continues bacteremia and gentamicin, and rifampin added. Fever and bacteremia resolved after 13 days from starting the combined therapy, repeated investigations did not show extend focus. The patient was stepped down to monotherapy (vancomycin) after clearance of bacteremia, where therapy discontinued after a course of 8 weeks with gradual resolution of heart vegetation on echocardiography follow-up.

2.3. Case 3

A 10-year-old boy, known to has a nephritic syndrome. Presented with a history of right thigh pain with inability to bear weight for a one-month duration, with a one-week history of fever. Initial workup showed WBC 7.4 x10^9/L with 72% Neutrophils, ESR of 74 mm/h and serum C-reactive protein 182 mg/dl and Blood culture grew MRSA with full sensitivity, MRI demonstrated right hip septic arthritis with effusion and right femur osteomyelitis (Fig. 3). Patient treated with intravenous vancomycin then soon shifted to oral clindamycin with smooth clinical improvement.

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