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Case Report

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A First and Rare Case of *Roultella ornithinolyrica* in paediatric patients in Saudia Arabia: A Case Report

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ABSTRACT

Raoultella ornithinolytica is an emerging Gram-negative pathogen that is rarely reported in children. We describe a case of severe R. ornithinolytica infection in a 4-month-old male infant from Saudi Arabia who presented with rapidly progressive pneumonia complicated by recurrent bilateral pneumothoraces and respiratory failure requiring prolonged intensive care support. The organism was identified on microbiological culture and demonstrated susceptibility to multiple antimicrobial classes, including carbapenems. The patient showed gradual clinical improvement following targeted antimicrobial therapy and supportive management. This case highlights the potential for R. ornithinolytica to cause severe, life-threatening infection in infants without overt immunodeficiency and underscores the importance of early recognition, accurate microbiological identification, and appropriate antimicrobial therapy.

Keywords: *Raoultella ornithinolytica, paediatric patients, respiratory failure*

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INTRODUCTION

Raoultella ornithinolytica is a Gram-negative, capsulated, non-motile, facultatively anaerobic bacillus belonging to the family Enterobacteriaceae.[1] The genus Raoultella comprises three species of clinical relevance, R. ornithinolytica, R. planticola, and R. terrigena.[2] Formerly classified as Klebsiella ornithinolytica, the organism was reassigned to the genus Raoultella following phylogenetic analyses based on 16S rRNA and rpoB gene sequencing, which demonstrated clear genetic divergence from the genus Klebsiella.[2,3] Members of this genus can be distinguished microbiologically by their ability to utilise histamine as a sole carbon source, growth at 4 °C, and the absence of gas production from lactose at elevated temperatures.[1,4]

R. ornithinolytica is widely distributed in nature and has been isolated from water, soil, plants, and hospital environments.[1,5] In humans, it is considered an opportunistic pathogen, with infections reported predominantly in individuals with compromised immunity, including elderly patients, those with chronic systemic diseases, malignancies, prolonged hospitalisation, or exposure to invasive procedures.[6-8] The organism has been implicated in a range of clinical syndromes, most commonly biliary tract infections, pneumonia, and bacteraemia.[6,9] Severe and occasionally fatal infections have also been described in vulnerable pediatric populations, particularly in neonates and premature infants.[10,11]

Although the majority of reported cases involve hospital-acquired infections in adults, R. ornithinolytica infections in children remain infrequently described in the literature.[10-12]

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Community-acquired infections in immunocompetent hosts are considered rare, and reports from the pediatric population are especially limited.[7,13] Available data suggest that the organism is generally susceptible to multiple antimicrobial classes, including cephalosporins, aminoglycosides, fluoroquinolones, β-lactam/β-lactamase inhibitor combinations, and carbapenems.[6,9] However, intrinsic resistance to ampicillin and ticarcillin is well recognised due to chromosomally encoded β-lactamases, and emerging resistance mediated by extended-spectrum β-lactamases, AmpC enzymes, and carbapenemases has been increasingly reported.[8,14,15]

Given the limited number of pediatric cases and the rarity of community-acquired infections, especially from the Middle East, further documentation is essential to improve clinical recognition and management. We report a case of Raoultella ornithinolytica infection in a 4-month-old male from Saudi Arabia, highlighting the clinical presentation, microbiological findings, antimicrobial susceptibility, and therapeutic outcome, and aim to contribute to the growing but still limited pediatric literature on this emerging pathogen.

CASE REPORT

A 5-month-old Saudi infant was admitted to the respiratory unit of Jubail general hospital King Abdulaziz St, Jubail City Center, Jubail 35514, Kingdom of Saudi Arabia with a 2-day history of cough, dyspnoea, rhinorrhoea, and fever. The child had been discharged four days earlier from the paediatric ward, where he was managed for an upper respiratory tract infection and was noted to have generalised hypotonia. The current admission was undertaken to rule out viral respiratory infections, including H1N1 and Middle East Respiratory Syndrome coronavirus.

The patient was born at term by normal spontaneous vaginal delivery at Al-Mouwasat Hospital, with a birth weight of 3.2 kg. There was no history of neonatal asphyxia, seizures, or perinatal complications. Immunisation was appropriate for the age. There was no known prior history of chronic illness. On admission, the infant was tachypneic with subcostal retractions and a barrel-shaped chest. Chest auscultation revealed bilateral rhonchi and crepitations. Cardiovascular examination showed a regular heart rate without murmurs. The abdomen was soft, with no initial organomegaly. Neurological examination revealed marked hypotonia, tongue fasciculations, head lag, internal rotation of the upper limbs, and a flat, open anterior fontanelle.

Initial laboratory investigations, including complete blood count, serum electrolytes, and arterial blood gas analysis, were within normal limits. Screening tests for H1N1 and MERS-CoV were negative. Brain computed tomography showed no structural abnormalities, except for prominent subarachnoid cerebrospinal fluid spaces. Thyroid function tests were requested but were pending at the time of deterioration.

Due to worsening respiratory distress characterised by tachypnoea, grunting, and subcostal retractions, the patient was transferred to the paediatric intensive care unit and intubated. Mechanical ventilation was initiated in assist-control mode. Initial chest radiography demonstrated bilateral pulmonary infiltrates with a mild right-sided pneumothorax. Oxygen supplementation was increased to 100 per cent, following which repeat imaging showed resolution of the pneumothorax, although bilateral infiltrates persisted.

On 13 January 2016, the patient experienced acute clinical deterioration with episodes of desaturation and bradycardia. Repeat chest radiography revealed bilateral pneumothoraces. Bilateral intercostal chest tubes were inserted, resulting in a transient improvement in oxygenation. Persistent air leaks and refractory hypoxaemia necessitated escalation to high-frequency oscillatory ventilation.

During the intensive care course, the patient developed generalised oedema associated with hypoalbuminaemia. Intravenous human albumin was administered for three days, resulting in partial biochemical improvement, although clinical oedema persisted. Empirical antimicrobial therapy included piperacillin–tazobactam and vancomycin, along with fentanyl infusion, intravenous fluids, and supportive care.

Microbiological culture isolated in blood within 48 hours identified *Raoultella ornithinolytica*, with a reported identification probability of 94 per cent. Antimicrobial susceptibility testing demonstrated sensitivity to piperacillin–tazobactam, third- and fourth-generation cephalosporins, carbapenems, aminoglycosides, fluoroquinolones, tigecycline, and trimethoprim–sulfamethoxazole. Resistance was noted to ampicillin, amoxicillin–clavulanate, cefazolin, cefuroxime, and nitrofurantoin.

With continued intensive care support and targeted antimicrobial therapy, the patient showed gradual clinical improvement. Ventilatory support was stepped down from high-frequency oscillatory ventilation to conventional ventilation and subsequently to synchronised intermittent mandatory ventilation. Follow-up chest radiographs demonstrated resolution of pneumothoraces and improved pulmonary infiltrates. The left chest tube was removed, with no recurrence of pneumothorax, while a minimal air leak persisted on the right side.

By 27 January 2016, the patient was afebrile, haemodynamically stable, and maintaining oxygen saturation above 95 per cent on reduced ventilatory settings. Neurological examination showed persistent hypotonia, and hepatomegaly of 4 cm below the costal margin was noted. A diagnosis of bilateral pneumonia with pneumothorax secondary to *Raoultella ornithinolytica* infection was made. Ongoing evaluation by paediatric neurology was planned to rule out an underlying neuromuscular disorder, including Werdnig–Hoffman disease.

DISCUSSION

Raoultella ornithinolytica has traditionally been regarded as a rare opportunistic pathogen, but an increasing number of case reports over the past decade suggest that its clinical significance is underestimated.[5,6] Most published cases describe infections in elderly patients, neonates, or individuals with underlying conditions such as malignancy, diabetes mellitus, chronic kidney disease, prematurity, or recent surgery [6–9]. As summarised in previously reported series, common clinical presentations include bacteraemia, urinary tract infection, pneumonia, biliary tract infection, and wound or soft-tissue infections.[5,6,9] The present case adds to this growing body of literature and highlights the potential for severe disease in the pediatric population.

Comparison with previously published cases shows that risk factors are present in the majority of patients. Neonatal and pediatric cases reported by Ozkan et al. and Abbas and Ahmad involved prematurity or congenital conditions, while adult cases frequently involved cancer, diabetes, or

postoperative states.[7,10,11] In contrast, our patient did not have a confirmed immunodeficiency, although the presence of hypotonia and the need for prolonged ventilatory support may have increased vulnerability to infection. Similar to earlier pediatric reports, the disease course in our case was severe and required intensive care support, reinforcing observations that *R. ornithinolytica* infections in infants and young children may present with disproportionate severity compared with adults.[10-12]

The clinical manifestations in previously reported cases have been heterogeneous, ranging from fever with altered sensorium to gastrointestinal, urinary, and respiratory symptoms.[5,6] Pneumonia has been documented in both adult and pediatric patients, but complications such as bilateral pneumothorax and persistent air leak are rarely described.[6,9] In the present case, the development of recurrent pneumothoraces and the need for high-frequency oscillatory ventilation suggest extensive pulmonary involvement. This expands the known clinical spectrum of *R. ornithinolytica* infection and indicates that the organism may be associated with severe lung injury in susceptible hosts.

Antimicrobial susceptibility patterns reported in the literature show considerable variability. Most isolates demonstrate intrinsic resistance to ampicillin, with additional resistance to early-generation cephalosporins frequently reported.[6,8] Several studies have documented resistance to third-generation cephalosporins and β-lactam/β-lactamase inhibitor combinations, and a small but concerning number of cases have described multidrug-resistant strains sensitive only to colistin or tigecycline.[11,14] In contrast, many earlier cases responded well to piperacillin–tazobactam, aminoglycosides, or carbapenems.[5-7] The isolate in the present case was susceptible to multiple antibiotic classes, including piperacillin–tazobactam and carbapenems, which is consistent with susceptibility profiles described in previous pediatric and adult reports. Prompt initiation of appropriate antimicrobial therapy, guided by susceptibility testing, likely contributed to clinical recovery.

Another relevant observation from previously published community-acquired cases is the environmental origin of *R. ornithinolytica*. Several authors have suggested exposure to soil, plants, or contaminated water as possible sources of infection in otherwise healthy individuals.[9,12] Although the source of infection in our patient could not be definitively established, both nosocomial acquisition during repeated hospitalisation and environmental exposure remain plausible. This aligns with earlier studies emphasising that *R. ornithinolytica* should not be dismissed as a contaminant when isolated from clinical specimens.[5,8]

Overall, comparison with previously reported cases indicates that *R. ornithinolytica* infection is not limited to immunocompromised adults and can cause severe, life-threatening disease in children. The present case contributes additional evidence that pediatric infections may follow a complicated clinical course, particularly when respiratory involvement is prominent. Increased awareness among clinicians and microbiologists is essential, as early recognition and targeted antimicrobial therapy remain key determinants of outcome. Further systematic reporting of pediatric cases is required to better characterise risk factors, clinical patterns, and evolving resistance trends associated with this emerging pathogen.[6,12,13]

CONCLUSION

Raoultella ornithinolytica is an emerging Gram-negative pathogen with increasing clinical relevance. Although traditionally regarded as an opportunistic organism affecting immunocompromised adults, this case demonstrates that it can cause severe, life-threatening infection in the pediatric population. The occurrence of complicated pneumonia with recurrent pneumothoraces in an infant underscores the potential for aggressive pulmonary disease and highlights the need for heightened clinical vigilance.

This case reinforces the importance of accurate microbiological identification and timely antimicrobial susceptibility testing, as empirical therapy may be inadequate due to intrinsic and emerging antimicrobial resistance. Early recognition of *R. ornithinolytica* as a true pathogen, rather than a contaminant, is critical to guide appropriate therapy and improve outcomes.

Given the limited number of reported pediatric cases, particularly from the Middle East, continued documentation is essential to better define the clinical spectrum, risk factors, and resistance patterns associated with this organism. Increased awareness among clinicians and microbiologists will facilitate early diagnosis, targeted treatment, and improved clinical outcomes in children affected by this emerging pathogen.

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