

# *Moraxella lacunata* Septic Arthritis in a Patient with Lupus Nephritis<sup>▽</sup>

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Received 19 July 2009/Returned for modification 27 August 2009/Accepted 15 September 2009

***Moraxella lacunata* is a rare, usually commensal gram-negative rod most commonly associated with eye infections. We report a unique case of noniatrogenic *M. lacunata* bacteremia and septic knee arthritis in a patient with class III-IV lupus nephritis and speculate on the association between invasive *Moraxella* infection and renal impairment.**

## CASE REPORT

On 5 December 2008, a 24-year-old woman with lupus nephritis presented at her routine nephrology appointment with a 1-week history of increasing edema, arthralgia, and intermittent fevers. One week prior, she had been discharged from a referring institution on a prednisone taper for an acute lupus flare. She was taking 60 mg of prednisone per day with 500 mg of mycophenolate mofetil (CellCept; self-initiated) twice per day at the time of her nephrology appointment. Examination revealed severe lower-extremity pitting edema, swollen knees, and a tender, swollen right wrist. Movement of her left knee induced severe pain.

At baseline, the patient's biopsy-proven class III-IV lupus nephritis was associated with mild joint swelling and minimal periorbital edema, typically responsive to corticosteroids and immunosuppressive therapy. Given her recent history of high-dose steroid and immunosuppressant usage, investigation into a source of her worsening renal dysfunction separate from her underlying lupus nephritis was warranted.

Laboratory studies indicated leukocytosis (white blood cell count,  $24 \times 10^3/\mu\text{l}$  [normal range,  $3.6 \times 10^3$  to  $11.0 \times 10^3/\mu\text{l}$ ]) and acute renal failure requiring emergent hemodialysis (potassium level, 6.8 meq/liter [normal range, 3.5 to 5.1 meq/liter]; blood urea nitrogen level, 200 mg/dl [normal range, 7 to 25 mg/dl]; and creatinine level, 4.2 mg/dl [normal range, 0.7 to 1.6 mg/dl]). Fecal cultures were unrevealing, urine cultures revealed 50,000 to 100,000 CFU/ml of *Citrobacter koseri*, and two of two blood cultures grew *Moraxella lacunata* (Table 1). She remained febrile with persistent *M. lacunata* growth in two of two blood cultures on the second day of admission, despite therapy every 6 h with 2.25 g of intravenous piperacillin-tazobactam, chosen for its broad-spectrum coverage of gram-negative rods including pseudomonas. Further studies to evaluate the source of her persistent bacteremia were performed; an echocardiogram showed a small pericardial effusion with no evidence of endocarditis, and bilateral knee arthrocentesis revealed *M. lacunata* growth from left knee synovial fluid (Table 2).

Following septic knee debridement, she clinically improved with 10 days of intravenous piperacillin-tazobactam and progressive advancement in her activities of daily living. She re-

mained afebrile until discharge. Surveillance blood and synovial fluid cultures on the third day of admission revealed no further bacterial growth. She continued to improve with eventual resolution of her renal failure.

This case highlights the invasive potential of *M. lacunata* and emphasizes the importance of searching for occult sources of infection, particularly in an immunocompromised host with renal failure.

*M. lacunata* is a gram-negative rod of usually low virulence that has most commonly been associated with eye infections and, occasionally, upper respiratory tract infections. We report a case of noniatrogenic *M. lacunata* bacteremia and septic knee arthritis in a patient with biopsy-proven WHO class III-IV lupus nephritis. Although there have been prior cases of septic arthritis associated with organisms of the *Moraxella* genus, this is the second case of invasive *M. lacunata* infection secondary to septic arthritis to be reported worldwide. The first reported case of septic arthritis associated with *M. lacunata* occurred in a 78-year-old man with human immunodeficiency virus infection (11).

A review of prior reports suggests a possible association between *Moraxella* infection and renally compromised hosts; at

TABLE 1. Characteristics of the bacterium isolated from the patient's bloodstream

| Test                        | Result                                 |
|-----------------------------|--|
| Anaerobic culture .....     | Negative                               |
| Aerobic culture .....       | Positive                               |
| Gram staining.....          | Gram-negative rods                     |
| Cultivation on:             |  |
| Blood agar .....            | Shiny colonies and dry colonies        |
| MacConkey agar .....        | No growth                              |
| Chocolate agar.....         | Shiny, mucoid colonies                 |
| Oxidase test.....           | Positive                               |
| Indole test.....            | Negative                               |
| Catalase test .....         | Positive                               |
| Vitek 2 <sup>a</sup> .....  | <i>Moraxella</i> group, 99% confidence |
| API 20NE <sup>b</sup> ..... | <i>M. lacunata</i> , 85% confidence    |

<sup>a</sup> Vitek 2 (bioMérieux Inc., Durham, NC) is an automated system for bacterial identification and antibiotic susceptibility testing.

<sup>b</sup> API test kits (bioMérieux Inc., Hazelwood, MO) are used for identification of bacteria and yeast.

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<sup>▽</sup> Published ahead of print on 30 September 2009.

TABLE 2. Positive biochemical reactions with identification cards for gram-negative bacteria<sup>a</sup>

| Test                | Agent yielding positive reaction   |
|---------------------|--|
| Vitek 2 card.....   | Glutamyl arylamidase <i>p</i> -nitroanilide (AGLTp)<br>Lipase (LIP)<br>Tyrosine arylamidase (TyrA)<br>Glycine arylamidase (GlyA) |
| <i>apiweb</i> ..... | Nitrate (NO <sub>3</sub> )<br>Gelatin (GEL)<br>Oxidase (OX)  |

<sup>a</sup> The patient's blood and synovial fluid isolates were identified based upon the following characteristics: aerobic gram-negative rods grew on sheep blood and chocolate agars but not MacConkey agar, were oxidase and catalase positive, and were indole negative (Table 1). When the isolates were tested with the Vitek 2 instrument (bioMérieux Inc., Durham, NC) using identification cards for gram-negative bacteria, an identified of *M. lacunata* was obtained with 99% confidence. When the isolates were tested using a manual API 20NE strip (bioMérieux Inc., Hazelwood, MO), the same identification was obtained with 85% confidence (Table 1).

the time of infection, one patient was undergoing hemodialysis (2), another had nephrotic syndrome (3), and another had diabetic nephropathy (8). Similarly, our patient had lupus nephritis requiring hemodialysis when she was diagnosed with *M. lacunata* septic arthritis. Chronic renal failure and hemodialysis impair the normal response of the immune system through several mechanisms: by impairing granulocyte locomotion, phagocytosis, and intracellular killing; by depressing cell-mediated immunity; and by activating the alternate complement pathway during hemodialysis (1, 7, 9).

In addition to renal compromise, other comorbidities associated with *M. lacunata* invasive infection include steroid use, preexisting infection with human immunodeficiency virus, and the presence of prosthetic valves (1, 8). However, there have been reports of *M. lacunata* endocarditis in immunocompetent hosts with native heart valves as well, suggesting that, independent of the immune status of the host, *M. lacunata* may be a more invasive pathogen than previously recognized (4, 5, 6).

Further, it appears that *Moraxella* species may have a predilection for bone and joint involvement. *Moraxella* species including *Kingella kingae* (previously known as *M. kingii*) and *M. osloensis* have been isolated from nonimmunocompromised patients and children with osteoarticular infections (2, 10, 13).

Prior studies with respiratory tissues have shown *M. catarrhalis* invasion to be dependent on a trigger-like uptake mechanism involving macropinocytosis, leading to lamellipodium formation and engulfment of the invading organism into macropinosomes (12). However, it is unclear at this time whether a similar mechanism may be involved in *Moraxella*'s propensity for bone and joint invasion.

While the roles of the immune status of the host and the presence of renal failure in facilitating invasion necessitate further study, the case reported herein and the literature review suggest that *M. lacunata*, traditionally viewed as an ophthalmic and respiratory tract pathogen, should not be overlooked in its potential for bone, joint, and endocardial invasion.

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