tibiotic therapy. Antibiotic cost calculation is an extremely complex and ever changing area. We therefore believe computerisation to be the only realistic means to accommodate this. The software system used offers flexibility, user-friendliness and compatibility with, and data transfer between, other programmes running.

Efficacy of antibiotics is clearly of prime importance. However, as antibiotic cost awareness is still in its early stages, the issue of efficacy of antibiotics has not been addressed in this study. We recommend cost as only one of a number of factors to be taken into account in antibiotic prescribing.

References


Endocarditis Caused by Neisseria elongata Subspecies nitroreducens: Case Report and Literature Review

L. Struillou, F. Raffi*, J.H. Barrier

Neisseria elongata subsp. nitroreducens, an usual commensal of the nasopharynx, can cause serious infections, usually endocarditis. A case of Neisseria elongata endocarditis complicating mitral valve prolapse in a patient allergic to penicillin is reported. Cure was obtained with a combination of ceftriaxone and gentamicin, there being no requirement for surgery during the acute phase of the disease.

The genus Neisseria of the family Neisseriaceae is composed of ten distinct species, only two of which are specifically pathogenic for the human being: Neisseria meningitidis and Neisseria gonorrhoeae. The other species, including Neisseria elongata, are generally commensals of the nasopharynx and only occasionally pathogenic. The clinical significance of commensal Neisseria isolates from blood cultures has been the subject of debate for some time. Neisseria were rarely found in earlier studies, being isolated in 0.1 % of positive blood cultures in a 1984 study (1), and were regarded as contaminants in 50 % of cases. However, the number of commensal Neisseria isolated in blood cultures has considerably increased in the last ten years. Grant et al. (2) reported the isolation of 95 Neisseria elongata strains from 1964 to 1988, noting that most of the first 50 strains came from the upper respiratory tract and only three from blood, whereas 23 of the next 45 isolates were from blood. These authors hypothesized that the emergence of a more virulent clone as well as changes in blood culture systems could explain these findings. Recent studies have indicated more clearly the pathogenicity of Neisseria elongata, particularly in endocarditis. Osteomyelitis caused by Neisseria elongata has also been reported (3). We report here a new case of endocarditis caused by Neisseria elongata subspecies nitroreducens.

Case Report. A 27-year-old man was admitted to our hospital in April 1992 with a three-week history of fever accompanied by chills and sweats. He had a history of mastoiditis in childhood and allergy to penicillin. On admission his temperature was 40 °C. He had generalized weakness with a recent weight loss of five kilograms. On clinical examination arthritis of the right ankle was noted. Heart auscultation was initially normal. Laboratory data included an erythrocyte sedimentation rate of 80 mm in the first hour, a C-reactive protein level of 120 mg/l, a leukocyte count of 12,000/mm³ and microscopic hematuria. In the absence of an apparent focus of infection, transthoracic echocardiography was performed and showed mitral valve prolapse. The valves were myxoid in appearance and very thickened but there was no evidence of vegetations. Blood cultures performed at admission were positive
within two days for a gram-negative bacillus which proved difficult to identify but seemed to be related biochemically to the genus *Kingella*. The organism was susceptible to almost all antibiotics tested including ampicillin, ceftriaxone and aminoglycosides. The patient was then treated intravenously with a combination of ceftriaxone (2 g/day) and gentamicin (140 mg every 12 h). Apyrexia was obtained within 24 h. After detection of a murmur indicating mitral valve insufficiency on the tenth day of hospitalization, transesophageal echocardiography was performed and demonstrated vegetation on the mitral valve and moderate grade I regurgitation. The portal of entry was considered to be a dental infection in the left second molar. Splenic infarction, confirmed on ultrasonography, occurred during the course of the infection but resolved without sequelae. Despite marked worsening of mitral regurgitation, the patient's condition remained hemodynamically stable. Gentamicin was discontinued after three weeks and ceftriaxone continued for a total of six weeks. The blood culture isolate was finally identified as *Neisseria elongata* subsp. *nitroreducens*. Valve replacement was required ten months after the acute phase of the disease due to slow degradation of ventricular function.

**Discussion.** *Neisseria elongata* includes three subspecies: *Neisseria elongata* subsp. *elongata*, *Neisseria elongata* subsp. *glycolytica* and *Neisseria elongata* subsp. *nitroreducens*. Only the last subspecies causes significant infections in humans. It is a nonmotile, strictly aerobic, oxidase-positive, gram-negative coccobacillus with complex nutritional requirements and an optimal growth temperature of 35 °C. It grows within 24 to 48 h the Bactec system and on 5% sheep blood agar. The organism was classified as CDC group M-6 until 1990, when biochemical and DNA studies led to its reclassification as a member of the genus *Neisseria* and the species *Neisseria elongata* (2). However, as its capacity to reduce nitrates distinguishes it from the two previously existing subspecies, a third subspecies, *Neisseria elongata* subsp. *nitroreducens* was introduced in the taxonomy. Because of biochemical properties in common with *Kingella denitrificans*, identification can be difficult, as in our case. The reactions useful for differentiating the three subspecies of *Neisseria elongata* and *Kingella denitrificans* are given in Table 1.

The main feature of septicemia caused by *Neisseria elongata* subsp. *nitroreducens* is endocarditis, first noted by Grant et al. (2). Wong and Janda (4) confirmed this finding in a series of 12 patients with septicemia accompanied by endocarditis in 75% of cases. The first case of endocarditis caused by *Neisseria elongata* subsp. *nitroreducens* was reported by Simor and Salit in 1983 (5). Since then, only four other cases have been described in detail in the English-language literature (2, 6, 7). Risk factors for endocarditis were generally present, including dental work, a history of rheumatic heart disease or endocarditis, and valve disease (4). When blood cultures are positive for *Neisseria elongata*, endocarditis should be sought systematically. In the absence of convincing clinical evidence of endocarditis, echocardiography should be performed, par-

### Table 1: Biochemical differentiation of the three subspecies of *Neisseria elongata* and *Kingella denitrificans*.

<table>
<thead>
<tr>
<th>Test</th>
<th><em>N. elongata</em> subsp. <em>nitroreducens</em></th>
<th><em>N. elongata</em> subsp. <em>elongata</em></th>
<th><em>N. elongata</em> subsp. <em>glycolytica</em></th>
<th><em>K. denitrificans</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Glucose</td>
<td>- or weakly +</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Catalase</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Nitrate reduction</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+ with gas formation</td>
</tr>
<tr>
<td>Nitrite reduction</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+ with gas formation</td>
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