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A 62-month retrospective epidemiological survey of anaerobic bacteraemia in a university hospital

L. Blairon[1], Y. De Gheldre[1], B. Delaere[2], A. Sonet[3], A. Bosly[3] and Y. Glupczynski[1]

[1]Department of Clinical Microbiology, [2]Infectious Diseases Unit and [3]Department of Haematology, UCL Mont-Godinne University Hospital, Yvoir, Belgium

ABSTRACT

The incidence of anaerobic bacteraemia was studied retrospectively over 62 months at Mont-Godinne University Hospital, Yvoir, Belgium. The distribution of organisms, clinical presentations, choice of antimicrobial therapy and clinical outcome were analysed. The proportion of positive blood cultures yielding obligate anaerobes was 3.3%. The overall incidence of clinically significant anaerobic bacteraemia was 0.51 cases/1000 patient admissions (0.61 cases/10 000 hospital-days), but was significantly higher in patients with active haematological malignancies than in other groups (5.97/10 000 vs. 0.33/10 000 hospital-days; $p < 0.05$). The *Bacteroides fragilis* group accounted for 61% of isolates, followed by *Clostridium* spp. (12.2%), *Peptostreptococcus* spp. and *Leptotrichia* spp. (7.3% each) and *Fusobacterium* spp. (4.8%). The most common risk-factors were gastrointestinal surgery (49%) and active haematological malignancies with chemotherapy and/or bone marrow graft (47%). One or more co-morbidities were present in 30 (77%) of 39 patients. The lower gastrointestinal tract (41%) and the oropharynx (23%) were the two most frequent presumed or proven sources for bacteraemia, with the origin remaining unknown in eight (20.5%) cases. The overall mortality rate (evaluated 7 days after the occurrence of bacteraemia) was 13%. Fatal outcome correlated with the severity of underlying diseases and the immunosuppressed status of the patients rather than with the causative pathogen or the effectiveness of antimicrobial therapy. Likewise, there was no difference in the mortality rate between patients with monomicrobial and polymicrobial bacteraemia. Overall, the data re-emphasise the importance of anaerobic bacteraemia, especially in patients with haematological malignancies.

Keywords Anaerobes, bacteraemia, co-morbidities, haematological malignancies, neutropenia, origin

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INTRODUCTION

Anaerobic bacteraemia is uncommon, accounting for 0.5–13% of all positive blood cultures [1–4]. This rate corresponds to an incidence of 0.5–1.0 cases/1000 hospital admissions [1,3]. The need for objective microbiological diagnosis of anaerobic bacteraemia still remains controversial. It has been proposed that the clinical characteristics of anaerobic infections should guide the empirical choice of antimicrobial therapy [4–6], and the value of performing anaerobic blood cultures routinely has been questioned in several recent studies [5,7,8]. However, other studies have shown that anaerobic bacteraemia often remains unsuspected on clinical grounds, and that a substantial proportion of patients with anaerobic bacteraemia do not receive appropriate antimicrobial treatment on an empirical basis alone [2,4].

Despite its low incidence, anaerobic bacteraemia remains associated with significant mortality [2–4,9]. Fatal outcome has often been correlated with age and underlying diseases [9], as well as with inappropriate antimicrobial treatment or a delay in starting appropriate treatment [2,4,10]. The aim of the present study was to evaluate retrospectively the incidence and clinical significance of anaerobic bacteraemia in a cohort of hospitalised patients, and to establish whether a shift in frequency and distribution had occurred.

Corresponding author and reprint requests: Y. Glupczynski, Department of Clinical Microbiology, Mont-Godinne University Hospital, B-5530 Yvoir, Belgium
E-mail: youri.glupczynski@skynet.be

METHODS AND MATERIALS

Setting

The Mont-Godinne University Hospital, Yvoir, Belgium, is a 380-bed tertiary-care teaching hospital with several specialised medical and surgical clinics, including cardiovascular, thoracic, orthopaedic, abdominal and neurosurgical wards. Facilities include a large pulmonary diseases unit (55 beds), a geriatric ward (30 beds), three medical-surgical intensive care units (24 beds), and a large oncology and haematology department that serves as a reference centre for haematological diseases in southern Belgium (provinces of Namur and Luxembourg). The haematology unit comprises 20 beds, six rooms with laminar flow, and ten rooms with positive pressure. Approximately 45 bone marrow transplants are performed annually.

Patients

Patients with blood cultures positive for anaerobic bacteria in the 62-month period between 21 January 1999 and 15 March 2004 were identified retrospectively from laboratory records. The hospital records of these patients were reviewed by a microbiologist, an infectious disease physician and a haematologist. Data were collected concerning age, gender, underlying diseases, empirical antimicrobial treatment and eventual changes in therapy when bacteriological results became available, proven or presumed foci of anaerobic bacteraemia, and outcome.

Bacteraemia was deemed to be clinically significant when the patient had one or more blood cultures positive for anaerobes and met one of the following criteria: leukocyte count $<100/mm^3$ or $>10\,000/mm^3$; temperature $>38°C$; or a physical examination or pathological or surgical evidence consistent with infection (e.g., isolation of anaerobes from a source other than blood, or evidence of barrier compromise). Potential contaminants (e.g., *Propionibacterium* spp.) that grew in only one of several blood cultures were discarded.

The source of infection was determined by radiological, surgical or microbiological evidence of barrier compromise, or an infectious pathology, such as abscess or necrosis. A bacteraemic episode was considered to be polymicrobial if two or more non-contaminant species were isolated from blood simultaneously or within 1 week of the initial blood culture positive for anaerobes. Based on National Nosocomial Infection Surveillance System guidelines, infections were deemed nosocomial if the positive blood culture was drawn >48 h after admission to the hospital [11].

Antimicrobial treatment was considered to be appropriate if the agents used for therapy had a spectrum of activity providing coverage for anaerobes and were found to be effective by in-vitro susceptibility testing.

Mortality was attributed to anaerobic bacteraemia when a patient died from uncontrolled sepsis within 7 days of the onset of the episode, in the absence of other non-infectious co-morbidities.

Cultures

Blood cultures were analysed with a BacT/Alert 240 system (bioMérieux, Marcy l'Etoile, France) following inoculation of 5–10 mL of blood into aerobic and anaerobic vials (BacT/Alert FA and SN bottles; bioMérieux). Blood culture bottles were incubated for a maximum of 5 days at 37°C with constant shaking. Positive anaerobic bottles were subcultured on tryptic soya agar containing sheep blood 5% v/v, and on Schaedler agar containing horse blood 5% v/v, and were incubated in an anaerobic atmosphere with an Anoxomat WS 80 device (Mart BV, Lichtenvoorde, The Netherlands). Bacterial colonies were identified by standard methods [12] and with an API 20A system (bioMérieux). Antibiotic susceptibility testing was performed by disk-diffusion [13] or Etest (AB Biodisk, Solna, Sweden) on Brucella blood agar supplemented with haemin 5 mg/L and vitamin K_1 1 mg/L) [14]. Disk inhibition zones were interpreted according to the guidelines of the Comité Français de l'Antibiogramme [13], and MIC values were interpreted according to CLSI (formerly NCCLS) guidelines [15].

Blood culture results were entered into a computerised laboratory database that allowed ward personnel to read the results as they became available. Information concerning positive blood culture results was also telephoned to clinicians as soon as the positive culture was identified, with simultaneous transmission to a consultant infectious diseases physician.

RESULTS

Overall, 4857 of 51 782 blood cultures were positive during the study period. Of the microorganisms isolated, 98.1% were bacteria (facultative anaerobes, 88.6%; Gram-negative non-fermentative bacteria, 6.2%; strict anaerobes, 3.3%) and 1.9% were fungi. The contamination rate was 2.5%. Blood cultures from 47 patients yielded 49 strict anaerobes (representing 3.3% of all episodes of bacteraemia). After review of the medical records, anaerobic bacteraemia was considered clinically significant in 39 patients (0.51 cases/1000 admissions). Blood cultures from two patients yielded mixed growth of two different organisms, so that 41 obligate anaerobes were isolated in total. Two major groups of patients presenting with anaerobic bacteraemia were identified: (1) patients with active haematological malignancies (n = 18); and (2) patients with various other clinical conditions (n = 21), including patients with a history of solid neoplasm (Table 1).

The mean incidence rate of anaerobic bacteraemia between 1999 and 2003 was 5.87/10 000 days of hospitalisation (95% CI, 2.54–9.20) for patients with haematological malignancies, compared with 0.33/10 000 days of hospitalisation (95% CI, 0.08–0.57) for other patient groups (p 0.0077 with T-test; Fig. 1). The total number of annual admissions, as well as the number of blood cultures obtained between 1999 and 2003, remained unchanged, while there was a linear trend towards an increased incidence of anaerobic bacteraemia during the study period