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Vancomycin versus cefazolin prophylaxis for cerebrospinal shunt placement in a hospital with a high prevalence of meticillin-resistant *Staphylococcus aureus*

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Summary International guidelines suggest that a high prevalence of meticillin-resistant *Staphylococcus aureus* (MRSA) infections should influence the use of vancomycin for surgical prophylaxis. In order to compare the efficacy and adverse effects of vancomycin versus cefazolin as antimicrobial prophylaxis for insertion of cerebrospinal fluid (CSF) shunts, a randomised prospective clinical trial was performed. Over a 16-month period, all consecutive adult patients who underwent CSF shunt insertion at a university hospital with a high prevalence of MRSA infections were included. Patients were randomly allocated to receive either vancomycin or cefazolin before surgery and followed-up for four weeks for the development of infections. Of the 176 patients included in the study, 88 received vancomycin and 88 cefazolin. Shunt infections were significantly less likely to be observed in patients who were on vancomycin prophylaxis (4% vs 14%; $P = 0.03$). All isolated staphylococci were resistant to meticillin. Mortality

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of patients with post-surgical infections was higher in the cefazolin group ($P = 0.02$). Our data suggest that use of vancomycin as prophylactic agent for cerebrospinal shunt placement reduces the rate of shunt infections in the context of high prevalence of MRSA.

Introduction

Infections are major complications of implantation of prosthetic devices. Placement of cerebrospinal fluid (CSF) shunts is complicated by infection in 5—41% of cases with increased mortality, risk of seizures and decreased intellectual performance.[1] CSF-related infections might also be associated with malfunctioning of shunt and often precipitate further surgery.[1]

Three meta-analyses demonstrated that perioperative use of antimicrobial agents significantly reduced the risk of subsequent infections in patients who underwent placement of CSF shunts.[2–4] The effect seems to be related to baseline infection rate on the ward in the absence of prophylaxis and disappears when the baseline infection rate is $\leq$5%. Trimethoprim-sulfamethoxazole, second-generation cephalosporins alone or in association with gentamicin, oxacillin, benzilpenicillin, and vancomycin were reported to be useful in reducing post-surgical infections when compared with placebo in patients who underwent placement of CSF shunts.[5–10] Most recently recommended prophylaxis regimens include oxacillin, vancomycin or cefazolin.[1,11] Local resistance rates should influence the choice of drugs for such patients.

Skin commensals are the predominant causes of post-operative shunt infections, more than 60% of which are resistant to multiple antibiotics, including meticillin.[1] In recent years, the increasing occurrence of nosocomial infections due to meticillin-resistant *Staphylococcus aureus* (MRSA) has been a particular concern.[12] In the SENTRY Antimicrobial Surveillance Program data, MRSA constituted 25% of 3051 *S. aureus* isolates, varying from 58% in Italy to 2% in The Netherlands.[12] In a retrospective cohort study conducted in our hospital in 1999, the majority of post-neurosurgical infections was due to staphylococci and 39% of *S. aureus* strains were meticillin-resistant.[13]

A major problem related to the increase of nosocomial MRSA is that outcomes of patients with these infections are considerably worse than those with meticillin-susceptible *S. aureus* infections.[14] Among neurosurgical patients, the mortality rates associated with MRSA infections are likely to be even higher, given the severe comorbidities frequently observed among these individuals.

Therefore, prevention of staphylococcal infections in wards with high prevalence of MRSA is of paramount importance. According to the Centers for Disease Control and Prevention (CDC), vancomycin should be used as surgical prophylaxis in situations with high prevalence of MRSA infections.[15] However, to the best of our knowledge, no clinical trials have been performed to compare vancomycin with other antibiotics for prophylaxis in neurosurgical patients. A consensus panel suggested that high rate of MRSA transmission is indicated by a threshold of 0.5 new nosocomial cases of MRSA per 100 admissions for hospitals with at least 500 beds.[16] In our institution, a 1700-bed university hospital, one new case of MRSA was detected per 100 hospital admissions in 2001.

The trial was undertaken to compare the efficacy of vancomycin and cefazolin in preventing bacterial infections following CSF insertion and to record any adverse effects.

Methods

Study design

This was a randomised prospective clinical trial. The study, approved by the department review committee, was performed at the department of neurosurgery at the 'Agostino Gemelli' Hospital, Catholic University of Medicine, Rome (Italy), a tertiary care centre with $\sim$60 000 patient discharges per year.

Patients aged $>$16 years who underwent elective placement of internal and external shunts between 1 December 2001 and 31 March 2003 were considered eligible for the study. Exclusion criteria were: known hypersensitivity to any of the drugs used in the study; pregnancy; lactating mothers; patients with severe impairment of renal function (serum creatinine $>$2 mg/day); antibiotic therapy within one week.