Methicillin-resistant Staphylococcus aureus (MRSA) is a gram positive bacterium that is genetically different from other strains of Staphylococcus aureus. MRSA is responsible for several difficult-to-treat infections in humans. MRSA is any strain of S. aureus that has developed, through horizontal gene transfer and natural selection, multiple drug resistance to beta-lactam antibiotics. β-lactam antibiotics are a broad spectrum group that includes some penams – penicillin derivatives such as methicillin and oxacillin, and cephems such as the cephalosporins.

Strains unable to resist these antibiotics are classified as methicillin-susceptible Staphylococcus aureus, or MSSA.

The emergence of antibiotic-resistant forms of pathogenic S. aureus (e.g. MRSA) is a worldwide problem in clinical medicine.

MRSA is prevalent in hospitals, prisons, and nursing homes, where people with open wounds, invasive devices such as catheters, and weakened immune systems are at greater risk of nosocomial infection (hospital-acquired infection). MRSA began as a hospital-acquired infection, but has developed limited endemic status and is now community-acquired as well as livestock-acquired. The terms HA-MRSA (healthcare-associated or hospital-acquired MRSA), CA-MRSA (community-associated MRSA) and LA-MRSA (livestock-associated) reflect this distinction.

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see Methicillin resistant Staphylococcus aureus epidural spinal abscess.

see Methicillin resistant Staphylococcus aureus ventriculoperitoneal shunt infection

Data suggest that use of vancomycin as prophylactic agent for cerebrospinal fluid shunt placement reduces the rate of shunt infections in the context of high prevalence of Methicillin resistant Staphylococcus aureus. [1)].

Based on data mainly from nonrandomized studies, antibiotic impregnated catheters (AICs) and silver coated catheters (SCCs), reduce the risk for infection in patients undergoing CSF shunting. Future studies should evaluate the higher risk for MRSA and gram negative bacteria infections. Additional trials are needed to investigate the comparative effectiveness of the different types of antimicrobial catheters [2)].

Case series

2016

Lewkonia et al reviewed a retrospective case series of patients with delayed infections after spinal fusion, and surveyed medical experts in Canada and the USA regarding their use of prophylactic antibiotics for patients undergoing invasive procedures following spine surgery. Infections after spinal fusion are a relatively common complication, which typically occur early in the postoperative period. Infections which occur more than 3 months from the index procedure are rare and are often caused by atypical pathogens. The proportion of infections that required debridement and occurred 6 months after the index procedure was 4.3% (7/162). Over 85% of these infections were polymicrobial, with one third of those containing methicillin-resistant Staphylococcus aureus [3)].

In 2012, the Affiliated People's Hospital of Jiangsu University experienced a putative outbreak of methicillin-resistant S. aureus (MRSA) that affected 12 patients in the Neurosurgery Department. In this study, whole-genome sequencing (WGS) was used to gain insight into the epidemiology of the outbreak caused by MRSA, and traditional bacterial genotyping approaches were also applied to provide supportive evidence for WGS. We sequenced the DNA from 6 isolates associated with the outbreak. Phylogenetic analysis was constructed by comparing single-nucleotide polymorphisms (SNPs) in the core genome of 6 isolates in the present study and another 3 referenced isolates from GenBank. Of the 6 MRSA sequences in the current study, 5 belonged to the same group, clustering with T0131, while the other one clustered closely with TW20. All of the isolates were identified as ST239-SCCmecIII clones. Whole-genome analysis revealed that four of the outbreak isolates were more tightly clustered into a group and SA13002 together with SA13009 were distinct from the outbreak strains, which were considered non-outbreak strains. Based on the sequencing results, the antibiotic-resistance gene status (present or absent) was almost perfectly concordant with the results of phenotypic susceptibility testing. Various toxin genes were also analyzed successfully. Our analysis demonstrates that using traditional molecular methods and WGS can facilitate the identification of outbreaks and help to control nosocomial transmission [4)].

2014

The rate of MRSA colonization in cranioplasty patients is three times higher than the average seen on ICU admission screening (19% vs. 6%). The cranioplasty surgical complication rate was 22.8% and SSI rate was 10.5%. The concurrent SSI rate for craniectomy was 1.9%. Organisms isolated were methicillin-resistant Staphylococcus aureus (4), methicillin-sensitive S. aureus (1), Propionibacterium acnes (1), and Escherichia coli (1). Factors associated with SSI were peri-operative vancomycin (68.6% vs. 16.7%, p=0.0217). Complication rates without (n=21) and with (n=36) the bundle were: SSI (23.8% vs. 2.8%, p=0.0217) and redo cranioplasty (19% vs. 0%, p=0.0152). Bundle use did not affect rates for superficial wound dehiscence, seizures, or hydrocephalus.

The cranioplasty bundle (which consisted of peri-operative vancomycin (4 doses), a barrier dressing through post-operative day (POD) 3, and de-colonization of the surgical incision using topical chlorhexidine from POD 4 to 7.) was associated with reduced SSI rates and the need for re-do cranioplasties [5)].

Case reports

A 63-year-old Japanese woman underwent evacuation of a subdural hematoma complicated by subarachnoid hemorrhage. Subsequent craniotomy for clipping and external decompression of an aneurysm of the neck was followed by cranioplasty using an autologous bone graft. The graft became infected with MRSA, which responded to intravenously infused vancomycin. The graft was then replaced with a ceramic implant. The implant site became reinfected with MRSA. Vancomycin infusion failed on this occasion, despite a favorable in vitro sensitivity test. After obtaining patient consent, investigative treatment was begun using long-term aseptic application of vancomycin 2.5% ointment, resulting in control of the infection and negative cultures.

The care of an infection at the site of cranioplasty with a ceramic artificial bone implant is difficult.

Our patient's infection resolved with the use of vancomycin ointment. In this case, blood concentrations of vancomycin remained below detectable levels, and no adverse effects resulted from application of vancomycin ointment.

Topical administration of vancomycin was more effective than systemic administration in the treatment of our patient's MRSA skull implant infection. No adverse effects from topical treatment were encountered over 3 years [6].

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