Researchers pinpoint most common causes of dangerous eye infection post surgery and trauma

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The most common cause of endophthalmitis, a potentially blinding condition that can occur after eye trauma, eye surgery, and eye injections, are the well-known *staphylococci* ("staph") and *streptococci* ("strep") bacterial strains, according to a study published in the August issue of *Ophthalmology* and based on a review of 25 years of cases at New York Eye and Ear Infirmary of Mount Sinai (NYEE).

The new study found that gram-positive bacteria, which include staph and strep infections, accounted for 95 percent of endophthalmitis cases. The findings could lead to better, faster treatment with antibiotics known to fight these targeted bacterial strains.

"Endophthalmitis remains one of the most devastating complications faced by patients, and the most challenging for ophthalmologists to treat," said lead study author Ronald C. Gentile, MD, Professor of Ophthalmology, Icahn School of Medicine at Mount Sinai and Chief, Ocular Trauma Service at NYEE. "Accurate diagnosis and appropriate and timely treatment are required to prevent irreversible vision loss. To be effective, treatment for endophthalmitis must begin immediately and often before the infecting organism has been identified. Thus, knowing ahead of time the spectrum of microorganisms causing the infection and the antibiotics that work best against them is critical. This is especially true in the era of superbugs and multi-resistant microorganisms."

The research team conducted a review of microbiologic records of all endophthalmitis cases at NYEE from 1987 - 2011. They were especially interested in identifying changes in the pathogens causing the condition over time to determine whether microorganisms causing endophthalmitis were becoming resistant to frontline therapies.

Working with a total of 988 microbes, they found no major change in the types of organisms causing endophthalmitis. The most common cause was bacteria (95 percent) with most, 85 percent, being gram-positive bacteria.

The most prevalent type of gram-positive bacteria found was coagulase-negative staphylococcus, making up about 40 percent of the cases. This was followed by *Streptococcus viridans* (12 percent) and *Staphylococcus aureus* (11 percent). Gram-negative organisms, which can be resistant to most available antibiotics, accounted for about 10 percent of cases and fungi for the remaining five percent.

After reviewing these cases, Dr. Gentile and his colleagues were reassured to find that over 99 percent of cases that were caused by the gram-positive forms of bacteria were treatable with the most commonly used antibiotic therapy, vancomycin. Of the cases caused by potentially antibiotic-resistant strains of bacteria, 92 percent of cases were able to be treated with another common therapy, ceftazidime.

However, in the review, they also found an increasing resistance of the bacteria to many first generation antibiotics, such as methicillin, and first, second and third generation cephalosporins.

"We noted that in endophthalmitis cases caused by *staph aureus*, resistance to methicillin increased from 18 percent in the late 1980s to just over 50 percent this past decade," said Dr. Gentile. "This is consistent with what other physicians have found throughout the United

States with methicillin-resistant *Staphylococcus aureus* (MRSA) causing severe skin and soft-tissue infections."

In addition to discovering an increasing bacterial resistance against certain commonly used antibiotics, the research team also found a trend towards decreasing microbial resistance against classes of antibiotics used less often in recent decades, including two forms in a class known as aminoglycosides. This finding was especially interesting since prior studies beginning in the 1980s across different medical specialties had noted an increasing resistance to these antibiotics.

Gentile said that since antibiotic resistance is a natural process in which bacteria evolve, the new research provides evidence that intentionally using an antibiotic less frequently for a while, a concept called antibiotic restriction, could help to combat the problem of antibiotic resistance. "While we know that new antibiotics are needed to keep up with resistant bacteria, antibiotic restriction or cycling of antibiotics may be one option in combating microbial resistance."

These findings are especially important since antimicrobial resistance is one of the most serious health threats reported by the U.S. Centers for Disease Control and Prevention (CDC). The research team notes that doctors and patients can play a role in decreasing antibiotic resistance by using antibiotics judiciously and through research that identifies the most effective antibiotics for specific conditions such as endophthalmitis.

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