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Continuous Antibiotic Prophylaxis in Pediatric Urology

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Abstract

Prophylaxis, a Greek term, means "to guard or avoid beforehand." The goal of antibiotic prophylaxis in paediatric urology is to prevent urinary tract infections (UTIs) in children who are at risk, such as those with hydroureteronephrosis and vesicoureteral reflux (VUR). Both benefits and risks of antibiotic prophylaxis for paediatric urologic diseases have been established. Antibiotic prophylaxis is at best unnecessary and at worst hazardous for all children with VUR, as well as those who have all degrees of hydronephrosis (HN) and hydroureteronephrosis. It is unknown whether prophylactic antibiotics will have a positive or negative effect on the body as it ages and develops. Over the last two decades, increased public and physician awareness of the truth of previous statements has resulted in a more selective approach to the use of prophylactic antibiotics. Although it was previously thought that most children with conditions such as VUR or hydronephrosis were at high risk of UTI and thus would benefit from continuous antibiotic prophylaxis (CAP), data from multiple studies has shown otherwise. The usage of prophylactic antibiotics has changed over the past 20 years as medical professionals and the general public have become more aware of the veracity of earlier claims. Contrary to what was previously believed, most children with diseases like VUR or hydronephrosis are not at high risk for UTIs and do not benefit from continuous antibiotic prophylaxis (CAP), according to evidence from numerous research.

Keywords: Pediatrics • Antibiotics • Prophylaxis • Urology

Introduction

Studies now make it possible to more accurately identify kids who will benefit from antibiotic prophylaxis, enabling a more specialised and personalised approach to healthcare. This article discusses the advantages and disadvantages of antibiotic prophylaxis in relation to a number of common paediatric urologic diseases, such as VUR, prenatally diagnosed HN, and hydroureter. Each condition lists the patient factors that put the child at a greater risk of UTI and its aftereffects. It is discussed how prophylactic antibiotics affect bacterial resistance, the microbiome, and potential long-term negative effects. The article's exploration of prebiotics and probiotics, two emerging antibiotic prophylactic alternatives, comes to a conclusion.

The use of CAP in infants with VUR is the topic of the hottest discussion in paediatric urology. Unquestionably, antibiotics are successful at eliminating bacteria and preventing UTIs. Children who received CAP had fewer UTIs, according to the results of the Swedish Reflux and the Randomized Intervention for Vesicoureteral Reflux (RIVUR) trials. The practise of placing every child with VUR on CAP [1-3] is still up for dispute. Furthermore, the question of whether children should be diagnosed with VUR and have a voiding cystourethrogram following their first febrile UTI is still up for dispute. It has been increasingly clear over the past 20 years that many children with VUR do not benefit from diagnosis or therapy.

With the use of several risk indicators for recurrent UTI, persistent VUR, pyelonephritis, and renal scarring, it is now possible to more accurately determine which kids will benefit from antibiotic prophylaxis and which ones won't. The chances of developing pyelonephritis and suffering renal damage have all been predicted in large part by the severity or grade of the VUR. Lower rates of resolution and a higher incidence of renal scarring are associated with higher reflux grades. Furthermore, regardless of grade, VUR that occurs sooner during bladder filling has been proven to be a risk factor for breakthrough UTIs. In addition to grade and bladder volume at reflux onset, other factors that can predict reflux resolution, UTI, and/or the risk of renal injury include gender, age, race, laterality, bladder pressure at reflux onset, the presence of renal scars, the presence of bowel and bladder dysfunction, and a history of recurrent UTIs.

Description

Bowel and bladder dysfunction are the most important measurable risk factors for the development of UTI in children (BBD). Adolescents with VUR and bowel and/or bladder dysfunction are particularly susceptible to recurrent pyelonephritis, even when they are on CAP. In comparison to 15% to 25% of children without BBD, it is projected that 45% to 56% of these children get repeated UTIs. Additionally, renal scarring, the rate of spontaneous resolution, and the failure rate following antireflux surgery are all higher in children with BBD [4].

The likelihood of a UTI occurring again is highest in the first 3 to 6 months following a UTI, and the more frequent and recurrent a child's UTI, the greater the likelihood that another UTI will occur [1]. Following a first UTI, neither the AAP nor the National Institute of Health and Care Excellence guidelines suggest routinely giving newborns and kids preventive antibiotics. The effectiveness of prophylaxis in children with VUR was questioned prior to the RIVUR and Swedish reflux trials by a number of small randomised trials including kids with low grades of VUR. The RIVUR trial compared trimethoprim-sulfamethoxazole (TMP-SMX) prophylaxis versus placebo in 607 kids with grade I-IV VUR following UTI.

Despite the RIVUR trial's original conclusions, a more detailed analysis of the data showed that 8 kids would need to get antibiotic prophylaxis for two years in order to stop just one instance of a fever or symptomatic UTI. Further, the incidence of renal scarring between groups (11.9% in the prophylactic group versus 10.2% in the placebo group) did not differ significantly (at the 2-year visit or 3–4 months after the child met the criteria for treatment failure). The most significant risk decrease for recurrent UTI was seen in children with BBD at baseline, a history of febrile UTI, or higher grades of VUR.

After the AAP 2011 recommendations were released, de Bessa and

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associates carried out a meta-analysis. A preliminary analysis of the trials revealed that CAP was only helpful for kids with high-grade VUR (Grade III/IV). However, the updated pooled estimate supported the use of CAP in all children with VUR, regardless of reflux grade, to prevent recurrent UTI with the addition of data from the 2014 RIVUR research. This advantage was supported by the most current systematic review and meta-analysis on the subject.

The reliability, validity, and heterogeneity of the data, like with any systematic review, play a significant role in the applicability of these two meta-analyses. among the researches Additionally, although randomised controlled trials offer the greatest available data, our clinical patient population is not always represented in them. Therefore, it is important to use caution when interpreting these results. Although it may be tempting, it is dangerous to automatically apply the findings of each RCT or systematic review to all children with VUR. Each of the eight RCTs had a unique patient cohort, which probably contributed to the variations in the outcomes that were seen.

Due to research underpowering, the prevention of renal scarring has not been demonstrated, despite some trials showing a modest benefit in utilising antibiotic prophylaxis to avoid symptomatic and febrile UTIs [5]. In a meta-analysis, Hewitt and associates investigated the impact of antibiotic prophylaxis on UTI-mediated renal scarring in 1427 participants who were 18 years of age or younger. Children who are at risk for renal injury also include those who are at risk for recurring or breakthrough UTIs since renal scarring increases with the frequency of febrile UTIs. Furthermore, compared to kids with UTIs but no reflux, kids with reflux and UTIs are more likely to get renal scarring. 50% of children with grades III or IV reflux had scars when they were children, and up to one-third of all VUR patients had kidney scars.

Rapid antibiotic therapy and eradication of any subsequent pyelonephritis episode both lower the likelihood of long-term kidney impairment. A child may benefit more from prophylactic antibiotics if their social circumstances make it likely that they won't receive timely diagnosis and treatment for a febrile UTI. This is because delaying treatment increases the risk of renal impairment and scarring. According to one study, the probability of developing new renal scarring increased by 0.8% for each hour antimicrobial therapy was postponed in treating a febrile UTI.

Making sure that only kids with confirmed UTIs receive antibiotic treatment will restrict the use of antibiotics and lower antibiotic resistance in addition to minimising the circumstances in which CAP is recommended. A recent study found that before receiving antibiotic treatment for suspected UTI symptoms, almost one-third of children under the age of two did not receive a urinalysis or a urine culture [6]. The most recent AAP recommendations for treating UTIs, which include taking a urine sample for urinalysis and urine culture in a feverish newborn with no evident cause of fever, are in stark contrast to this. Furthermore, effective antibiotic administration could help lower antibiotic resistance, even if only on an as-needed basis.

A collection of bacteria, archaea, fungus, protozoa, and viruses known as the microbiota are found throughout the body. Humans have a huge population of microbes living on their skin, in their nasal and oral cavities, and in their gastrointestinal tracts. In actuality, microbial cells exceed human cells ten times over, and the colon is the area that is most thickly populated. Finally, the importance of microbiota in maintaining healthy bodily functions and the importance of a balanced microbiome for host immunity, metabolism, and pathogen resistance are being recognised by health care professionals [7]. Furthermore, disease states may be brought on by modifications to the "normal" microbiome. Examples of the effects of antibiotic-induced alterations in the human microbiome include healthcare-associated illnesses.

Conclusion

It's becoming less typical and ubiquitous to use CAP in a generally nonselective manner for kids with VUR, HN, and hydroureteronephrosis. Now that specific risk factors for UTI, renal damage, and its aftereffects can be identified, CAP can be used more wisely and effectively. Health care practitioners must utilise CAP cautiously due to the potential long-term negative effects of antibiotics. Reduced usage of antibiotics will slow the spread of bacterial resistance in both the individual and the population levels. Additionally, reducing antibiotic use will lessen the effects on a child's microbiome, which is now widely acknowledged to play a significant role in healthy body development and functions.

Acknowledgement

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Conflict of interest

None declared.

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