The Analysis of Escherichia Coli Resistance in Urine Culture and in Antibiograms as Requested by Emergency Service

Acil Servisten İstenen İdrar Kültür ve Antibiogramlarında Escherichia Coli Direncinin Analizi

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SUMMARY

Objectives

The aim of this study was to determine the antibiotic resistance of infectious and non-infectious *E. coli* species in order to increase the success of empirical antibiotic treatment in urinary system infections.

Methods

The antibiotic susceptibility of 464 *E. coli* strains that were isolated from urine samples of patients who visited Derince Training and Research Hospital Emergency Department between January 1 and December 31, 2012 were retrospectively evaluated from records. The antibiogram results were classified as susceptible, moderately susceptible or resistant. Moderately susceptible strains were assumed to be resistant.

Results

Bacterial proliferation was seen in 563 (28.1%) of the 1998 urine cultures tested. One hundred and twelve cultures could not be evaluated due to contamination, and there was no proliferation in 1323 cultures. *E. coli* strains were isolated in 464 (82.4%) of the cultures in which proliferation was seen. Three hundred and sixty seven (79%) of the patients were female, 97 (21%) were male, and the mean age of all of the patients was 41.1±24.1 years (min: 1, max: 90). The antibiograms of the *E. coli* strains revealed that meropenem had the lowest resistance (0%), while ampicillin-sulbactam had the highest resistance (36.8%).

Conclusions

In this study, we investigated the antibiotic resistance of *E. coli* strains isolated from urine cultures in our region. Future studies, perhaps similar to this one, can be performed in the future to increase the success of treatments.

Key words: Culture; *E. coli*; emergency; urine.

ÖZET

Amaç

Bu çalışmada üriner sistem enfeksiyonlarında ampirik antibiyotik tedavi başarısını artırmak için enfeksiyon etkeni olan veya olmayan E.coli suşlarının çeşitli antibiyotik türlerine direnci araştırıldı.

Gereç ve Yöntem

1 Ocak-31 Aralık 2012 tarihleri arasında Derince Eğitim ve Araştırma Hastanesi acil servisine başvuran hastaların mikrobiyoloji laboratuvarına gönderilmiş idrar örneklerinden izole edilen 464 E.coli suşunun antibiyotik duyarlılıkları bilgisayar kayıtları üzerinden retrospektif olarak değerlendirildi. Antibiyogram sonuçları duyarlı, orta duyarlı ve dirençli olarak sınıflandırıldı. Orta duyarlı suşlar dirençli kabul edildi.

Bulgular

1998 idrar kültüründen 563'ünde (%28.1) üreme oldu. Kültürlerin 112'si kontaminasyon nedeniyle değerlendirilemedi, 1323 kültürde ise üreme olmadı. Üreme olan kültürlerden 464'ünde (%82.4) E.coli suşları izole edildi. Hastaların 367'si (%79) kadın 97'si (%21) erkek, tüm hastaların yaş ortalaması 41.1±24.1 (min: 1, maks: 90) idi. E.coli suşlarına karşı antibiyogramlar incelendiğinde, direncin en düşük görüldüğü antibiyotik meropenem (%0), en yüksek görüldüğü antibiyotik ise ampisilin-sulbaktam olarak saptandı (%36.8).

Sonuç

Bölgemizde idrar kültürlerinden izole edilen E.coli suşlarına karşı antibiyotik dirençlerini incelediğimiz çalışmamızın benzerlerinin ilerleyen dönemde yapılmasının tedavi başarısına yardımcı olacağını düşünmekteyiz.

Anahtar sözcükler: *Kültür; E.coli; acil; idrar.*

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Introduction

Urinary system infection is defined by the existence of bacteria in the kidneys, collecting duct system, and/or urinary bladder, as well as pyuria and clinical symptoms. Its severity ranges from asymptomatical bacteriuria to pyelonephritis.[1] Urinary system infection is the most common type of infection in adults.[2] 25-35% of women between the ages of 20-40 years have urinary system infection,[3] and there are 5 million attacks of cystitis in our country every year.[4] *E. coli* is present in 50-90% of these infections. Antibiotics are commonly used to treat urinary system infections, although they should be used with caution. The most important issues to monitor during antibiotic treatment are duration of treatment, toxicity of the medication, and cost. Antibiotics used should not spoil the intestinal, perineal and vaginal flora, but should be effective against *E. coli* colonization.[5] Local antibiotic resistance should be followed up regularly in order to successfully treat urinary system infections.[6] Several studies have shown that antibiotic resistance is increased in *E. coli* strains that cause urinary system infections. Antibiotic resistance is particularly common with cotrimoxazole and betalactams, which are relatively old molecules.[7] However, more recent research has indicated that resistance is increasing in fluoroquinolones as well.[8] In this study, the antibiotic resistance of infectious and non-infectious *E. coli* species was investigated to increase the success of empirical antibiotic treatment in urinary system infections.

Materials and Methods

Patients with symptoms of urinary tract infection who presented at Derince Training and Research Hospital Emergency Department, Turkey, between January and December 2012 were included in this study. Clinical evidence for urinary tract infection included dysuria, fever, urgency, frequency, suprapubic or flank pain, or other clinical presentations consistent with a urinary tract infection. For patients with more than one sample, we included only the first positive sample. The antibiotic susceptibility of 464 *E. coli* strains was retrospectively evaluated from hospital records. The ethics committee approved this study. The urine samples were isolated in a sterile way, inoculated in 5% sheep blood agar (RTA) and EMB (RTA) via a quantitative method, and were placed in an incubator (37°C) for 24-48 hours. Bacteria were detected by gram staining, evaluating colony morphology, and by traditional biochemical tests (TSI agar, Simmon's citrate agar, movement medium, Christensen urea agar, reactions in indol medium, catalase, oxidase, coagulase, esculin hydrolysis). Bacteria were identified by an automated Phoenix system (BBL Becton Dickinson). Antibiotic susceptibility in proliferating bacteria was evaluated by the Kirby-Bauer disc diffusion method in accordance with the CLSI (Clinical Laboratory Standards Institute) criteria using Müler-Hinton agar (RTA) for automated systems. *Escherichia coli* (ATCC 25922), *Staphylococcus aureus* (ATCC 29213), *Staphylococcus aureus* (ATCC 25923) and *Pseudomonas aeruginosa* (ATCC 27853) were used as quality controls. The antibiogram results were classified as susceptible, moderately susceptible or resistant. Moderately susceptible strains were assumed to be resistant.

Statistical Analysis

Data from this study were recorded and evaluated using SPSS version 13.0 for Windows. The Chi-square test was used to evaluate categorical variables. Continuous variables were expressed as mean±standard deviation, minimum and maximum values were expressed as parenthetical values, and qualitative variables were expressed as number and percentage (%). $P<0.05$ was regarded as statistically significant.

Results

Bacterial proliferation was detected in 563 (28.1%) of the 1998 urine cultures. One hundred and twelve cultures could not be evaluated due to contamination and there was no proliferation in 1323 cultures. *E. coli* strains were isolated in 464 (82.4%) of the cultures in which there was proliferation. Three hundred and sixty seven (79%) of the patients were female, 97 (21%) were male, and the mean age of all of the patients was 41.1±24.1 years (min:1, max:90). Antibiograms of the *E. coli* strains revealed that the lowest resistance was found in cultures treated with meropenem (0%), nitrofurantoin (3.9%), ceftazidime (8.2%), gentamicin (8.3%), and cefepime (9.5%). Those with the highest resistance included amoxicillin-clavulanic acid (23.4%), ampicillin-sulbactam (36.8%), norfloxacin (14.9%), cefazoline (15.1%), ceftriaxone

Table 1. Resistance rates of antibiotics

Antibiotic	Resistance (%)
Meropenem	0
Nitrofurantoin	3.9
Ceftazidime	8.2
Gentamicin	8.3
Cefepime	9.5
Amoxicillin- Clavulanic Acid	23.4
Ampicillin-Sulbactam	36.8
Norfloxacin	14.9
Cefazoline	15.1
Ceftriaxone	11.1
Cefuroxime	12.9
Ciprofloxacin	17.7
Cotrimoxazole	28