STUDY ON MINIMUM INHIBITING CONCENTRATION OF ANTIBIOTICS TOWARDS STAPHYLOCOCCUS EPIDERMIDIS STRAINS ISOLATED FROM CLINICAL MATERIALS

Tz. Dimitrov, M. Grigorova, G. Kaprelyan

The increasing etiologic role of St. epidermidis (SE) for human pathology is closely related to the proper therapy, i. e. to the characteristic antibiotic-sensitiveness of isolated strains.

Based on the importance of the problem for the practical medicine, the object of our study is to determine the antibiotic activity in different concentration and estimate the detailed antibiotic-resistance of SE in order to analyse the tendency of its development and help the practical antibiotic therapy.

Material and methods

Antibiotic-resistance of SE-strains (total number — 100 strains) was tested towards 12 antibiotics which were, by that time, widely applied against staphylococcal infections (penicillin, ampicillin, carbenicillin, streptomycin, kanamycin, gentamycin, erythromycin, chloramphenicol, novobiotin, tetracyclin, meticillin, palitrex). Minimum inhibiting concentration (MIC) was determined by gradual dilution of any antibiotic in liquefied nutritious media (veal broth with pH=7,1).

The estimation of statistical reliability of our data was done by using the method of maximum mistake (Δ) with $t=1,96$.

Results and discussion

Low concentrations of palitrex (0,78—0,34 mg/ml) suppress up to 61,25% of the studied strains. The rest concentrations are active towards single strains only. MIC of meticillin tends to higher values: 1,56—0,34 mg/ml and 55% of the strains are affected. MIC of ampicillin is located in the lower concentrations: 0,042—0,015 mg/ml, unlike to that of carbenicillin (higher concentrations), with values similar to those of meticillin. Penicillin and ampicillin have same activity level; 50% of the strains are suppressed by only 0,085—0,015 mg/ml. As for streptomycin, its active concentration is considerably high: 12,5—200 mg/ml, but certain single strains are influenced by lower concentrations. Gentamycin has contradictory (to streptomycin) action: highest number of strains (68%) are affected by lowest concentrations (0,021—0,015 mg/ml) and only single strains are influenced by higher concentrations (3,12—6,25 mg/ml). Similar action shows kanamycin: 54% of all strains are suppressed by concentrations 0,21—0,015 mg/ml; only single strains are sensitive to higher values (25 mg/ml). Erythromycin, in concentrations near 200 mg/ml, suppresses 63,64% of the studied strains. Chlorocide shows 2 peaks: higher (50,0 mg/ml) and lower (3,12 mg/ml). Novobiotin influences 64% of the strains in concentration of 0,085—0,015 mg/ml, but its highest active level is 25 mg/ml.

SE has limited sensitiveness towards tetracyclin: MIC is near the resistance level (12,5—200 mg/ml) for 78% of all strains.

Bacteriostatic and bactericidic actions have a common character and developing tendencies; loosing of bactericidic activity foregoes MIC. This process is well expressed with those antibiotics whose MIC has higher values.

Palitrex and meticillin show a coincidence of bactericidic effect and MIC. Ampicillin presents a low bactericidic effect; various concentrations suppress equal number of strains.

Bactericidic action of gentamycin (also bacteriostatic) is performed in its lower concentrations (0,042—0,015 mg/ml).

Novobiotin, having an expressed bacteriostatic effect in lower concentrations (0,042—0,015 mg/ml) presents its bactericidic effect in its higher concentrations (50—200 mg/ml).

The results of the studied sensitiveness of SE (MIC-gradual determination) show that penicillinase-stable penicillins are most active. Over 90% of all strains are sensitive to 12,5 mg/ml or even less. Penicillin G (amongst the first antibiotics applied in the practice) presents an expressed activity too. Only 12% of the strains are suppressed with 25 mg/ml (or more). These data prove the established tradition of decreasing in number of stable strains towards penicillin.

The sensitiveness towards gentamycin, kanamycin, novobiotin, is always high (73—100%). In contrast to them streptomycin (being longer applied) is less active; nearly 50% of the strains are resistant.

Antibiotics from the 3rd group (erythromycin, chlorocid, tetracyclin) are least active. Their MIC is 25 mg/ml for 50% of the studied strains; as for erythromycin, its MIC is 200 mg/ml (or more) for greater number of strains.

The results of the studied sensitiveness towards penicillin and the tendency of its increasing activity (together with that of erythromycin) show a necessity of new tactics and replacement of some antibiotics in clinical therapy.

Bentley, D. et al. (1970) reports that in the process of chloramphenicol treatment are isolated SE-biotypes, resistant simultaneously towards chloramphenicol, streptomycin, kanamycin, etc. (some 5—6 antibiotics at the same time). On the contrary, after forbearance from chlorocid application, the percent of resistant strains (20%) goes down to 9% for one year only. Similar decrease is established with other antibiotics: tetracyclin, erythromycin.

The obligation of antibiotic replacement is actual. Some authors (Blair, E. B. — 1967) report that the control of antibiotic application tends to restricted interhospital (nososomal) staphylococcal infections.

REFERENCES

1. Хатеневер, М. Л., А. К. Акатов. Устойчивость к антибиотикам и солям тежелых металлов штаммов Стафилококус епидермидис относящихся к разным биотипам. Тезисы докл. Всесоюзной Конф. Стафилок. и Внутриб. Инф., Саратов, 1975. — 2. Annear, D. L., and W. B. Grubb. Unstable resistance to meticillin in St. epidermidis. — *J. Med. Microb.*, 1973, 6/3, 393—398. — 3. Bentley, D., H. Jerome, M. Lepper. Dissemination resistance to chloramphenicol of S. epidermidis: Epidemiology and laboratory investigations. — *J. Inf. Dis.*, 1970, 122, 5, 364—375. — 4. Corse, L. and R. E. O. Williams. Antibiotic resistance of coagulase-negative Staphylococci and Micrococci. — *J. Clin. Path.*, 1968, 21/6, 722—728. — 5. Shaw, W. V., D. W. Bentley, L. Sands. Mechanism of chloramphenicol resistance in S. epidermidis. — *J. Bacter.*, 1970, 104/3, 1095—1105.

ИССЛЕДОВАНИЯ МИНИМАЛЬНОЙ ИНГИБИРУЮЩЕЙ КОНЦЕНТРАЦИИ АНТИБИОТИКОВ К ШТАММАМ СТАФИЛОКОККУС ЭПИДЕРМИДИС, ИЗОЛИРОВАННОГО ИЗ КЛИНИЧЕСКОГО МАТЕРИАЛА

Ц. Димитров, М. Григорова, Г. Капрелян

РЕЗЮМЕ

Изучена минимальная ингибирующая концентрация (МИК) 12 антибиотиков к 100 штаммам Стафилококкус эпидермидис. Наибольшей активностью обладают пенициллиназо-стойкие пенициллины. Более 90% всех штаммов чувствительны при 12,5 mg/ml и ниже этой концентрации. Чувствительность к гентамицину, канамицину и новобиоцину остается высокой (73—100%). Наиболее высокой активностью отличаются антибиотики макролидной группы и тетрациклины. У них МИК в 50% Стафилококковых штаммов составляет 25 mg/ml и больше. Результаты чувствительности к пеницилину и тенденции к ее повышению, а также и активность эритромицина, совершенно ясно указывают на необходимость определения известной тактики при использовании и замене антибиотиков в лечебной практике.