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가 가

cephapirin 가 ofloxacin, vancomycin, 15

. 2mg/Mℓ 5mg/Mℓ ofloxacin 가

8.14±0.99μm/hr, 12.22±0.71μm/hr 가

(p>0.05), 60μg/Mℓ 10 mg/Mℓ vancomycin 10.72±1.20μm/hr, 10.56±2.25μm/hr

/hr (p>0.05). 10mg/Mℓ cephalosporin (325

mOsm) 3.42±3.29μm/hr 가 (p>0.05), 20mg/Mℓ

cephapirin -19.37±1.80μm/hr(p<0.05) (deswelling)

20mg/Mℓ cephalosporin (374 mOsm) . 10mg/Mℓ van-

comycin 5mg/Mℓ ofloxacin (294 mOsm) -1.43±0.76μm

/hr (p>0.05).

가 (41:

1272 ~ 1278, 2000).

= Abstract =

The Effect of Antibiotics in the Irrigation Solution on Corneal Endothelial Function

< : 2000 1 12 , : 2000 5 16 >

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* 1998 80

The practice of adding antibiotics to anterior chamber-irrigating solutions as a prophylaxis for endophthalmitis has been used recently. To evaluate corneal endothelial toxicity of different concentrations of antibiotics in irrigating solutions, rabbit corneas were mounted in the in-vitro dual-chambered specular microscope and the endothelium was perfused with glutathione-bicarbonate Ringer solution(GBR) containing antibiotics such as ofloxacin, vancomycin or cephapirin. Mate corneas were perfused with GBR alone and used as control. Corneal thickness was measured every 15 minutes throughout the perfusion period and corneal swelling rates were calculated. Swelling rates of corneas perfused with 2mg/Mℓ or 5mg/Mℓ ofloxacin, 60μg/Mℓ or 10mg/Mℓ vancomycin, and 10mg/Mℓ or 20mg/Mℓ cephapirin was not significantly different from that of control(p>0.05). The corneas perfused with 20mg/Mℓ cephapirin deswelled probably due to high osmolarity of it. Perfusion with 10 mg/Mℓ vancomycin plus 5mg/Mℓ ofloxacin did not show corneal swelling compared to control(p>0.05). This study demonstrates that the above concentrations of antibiotics in irrigating solutions do not affect endothelial function of the rabbit cornea(J Korean Ophthalmol Soc 41:1272 ~ 1278, 2000).

Key Words : Cephapirin, Corneal swelling rate, Irrigating solution, Ofloxacin, Vancomycin

0.05 0.5%^{1,2)} 가

(wound complication)

³⁾

Staphylococcus

epidermidis가 가

Staphylococ-

가 (2~3kg) 29 (58)

cus aureus, Streptococcus species, Proteus

species, Pseudomonas aeruginosa

2mg/Mℓ

^{2,4)}

5mg/Mℓ ofloxacin, 60μg/Mℓ 10mg/Mℓ van-

comycin, 10mg/Mℓ 20mg/Mℓ cephapirin

10mg/Mℓ vancomycin 5mg/Mℓ ofloxacin

7

(pancuronium bromide) 가

가

⁵⁻⁸⁾

2~3mm

Dikstein

Maurice⁹⁾가

quinolone ofloxacin, cephalosporin
cephapirin, vancomycin

가
가

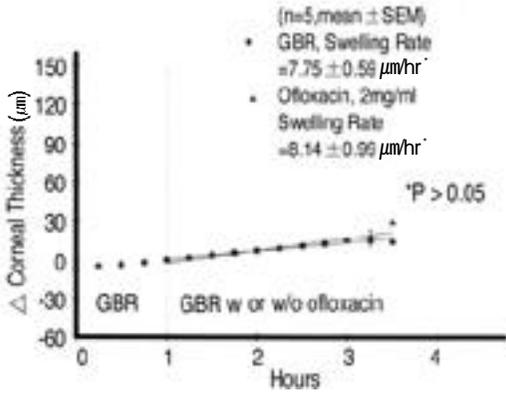


Figure 1. Rabbit corneal perfusion : effect of 2mg /Mℓ ofloxacin

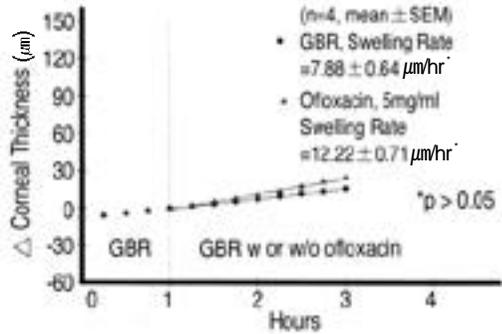


Figure 2. Rabbit corneal perfusion : effect of 5mg /Mℓ ofloxacin

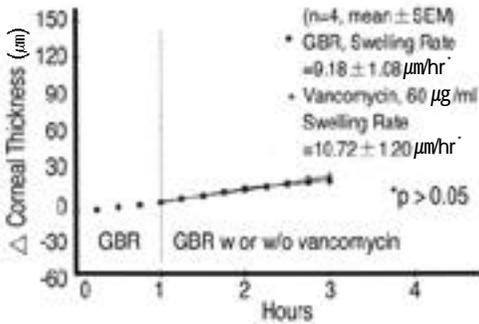


Figure 3. Rabbit corneal perfusion : effect of 60 μg/Mℓ vancomycin

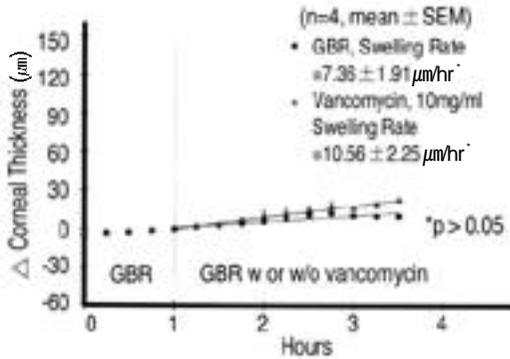


Figure 4. Rabbit corneal perfusion : effect of 10 mg/Mℓ vancomycin

(Dow Corning 200 Fluid,
)
glutathione-bicar-
bonate-Ringer(GBR) 1
가
GBR 2
GBR 3
GBR NaCl
111.56mM, KCl 4.82mM, NaHCO₃
29.20mM, glucose 5.01mM, CaCl₂ · 2H₂O
1.04mM, MgCl₂ · 6H₂O 0.78mM, NaH₂PO₄
0.86mM, glutathione 0.30mM
pH 7.4 285 300mOsm
34 292mOsm)

, 0.1Mℓ/min,
15 20mmHg
15
student t-
test가 p 0.05
2mg/Mℓ ofloxacin(
5mg/Mℓ ofloxacin(
283mOsm)

8.14 ± 0.99 μm/hr, 12.22 ± 0.71 μm/hr
 (7.75 ± 0.59 μm/hr, 7.88 ± 0.64 μm/hr)
 가 (Fig. 1,2). Vancomycin
 60 μg/Mℓ (282mOsm)
 10.72 ± 1.20 μm/hr 10mg/Mℓ (
 292mOsm) 10.56 ± 2.25 μm/hr

(9.18 ± 1.08 μm/hr, 7.36
 ± 1.91 μm/hr) (Fig.
 3, 4). 10mg/Mℓ cephalirin(
 325mOsm)
 3.42 ± 3.29
 μm/hr (2.21 ± 0.75 μm/hr)
 가 (Fig. 5), 20mg/Mℓ cephalirin
 -19.37 ± 1.80 μm/hr
 (p<0.05) 가
 (deswelling) 20mg/Mℓ cephalirin
 (374mOsm) (Fig.
 6). 10mg/Mℓ vancomycin 5mg/Mℓ
 ofloxacin (294mOsm)
 -1.43 ± 0.76 μm
 /hr (3.98 ± 1.84 μm/hr)
 (Fig. 7)(Table 1).

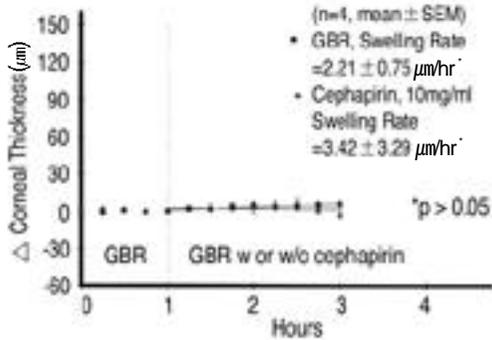


Figure 5. Rabbit corneal perfusion : effect of 10 mg/Mℓ cephalirin

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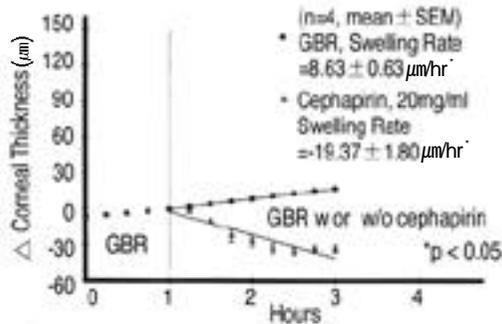


Figure 6. Rabbit corneal perfusion : effect of 20 mg/Mℓ cephalirin

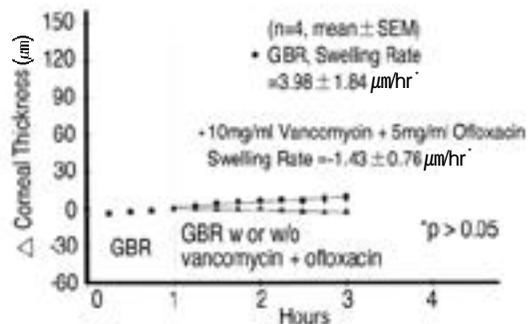


Figure 7. Rabbit corneal perfusion: effect of 10mg/Mℓ vancomycin plus 5mg/Mℓ ofloxacin

Table 1. Corneal swelling rates of experimental and control group

	Experimental Group	Control Group
ofloxacin 2mg/Mℓ	8.14 ± 0.99 μm/hr	7.75 ± 0.59 μm/hr
ofloxacin 5mg/Mℓ	12.22 ± 0.71 μm/hr	7.88 ± 0.64 μm/hr
vancomycin 60 μg/Mℓ	10.72 ± 1.20 μm/hr	9.18 ± 1.08 μm/hr
vancomycin 10mg/Mℓ	10.56 ± 2.25 μm/hr	7.36 ± 1.91 μm/hr
cephalirin 10mg/Mℓ	3.42 ± 3.29 μm/hr	2.21 ± 0.75 μm/hr
cephalirin 20mg/Mℓ	-19.37 ± 1.80 μm/hr	8.63 ± 0.63 μm/hr
vancomycin 10mg/Mℓ + ofloxacin 5mg/Mℓ	-1.43 ± 0.76 μm/hr	3.98 ± 1.84 μm/hr

0.05 0.5%^{1,2)} (nephrotoxicity) (ototoxicity)
 iodine 가¹⁶⁻¹⁸⁾가
 , , ,
 가,
 가 .
 Geroski ⁶⁾ 10mg/Mℓ vancomycin
 , Sher- 가 BSS
 wood ¹⁰⁾ Dickey ¹¹⁾ Plus 가 , 2mg/
 29 43% Mℓ gentamicin
 . Adenis ¹⁾ 20μg/Mℓ vancomycin , gentamicin amikacin BSS Plus
 가 가
 . Thomas ¹⁹⁾ 50
 (phacoemulsifier) 가 가 375, 750,
 1875, 7500μg/Mℓ vancomycin 48
 , Ordan ¹²⁾
 gentamicin , gen-
 tamicin (Optisol)
 . 150μg/Mℓ vancomycin 가 6
 가 가 가 8 12
 가 가 가
 Gills ⁷⁾ gen- vancomycin 20μg/Mℓ
 tamicin(8μg/Mℓ), vancomycin(20μg/Mℓ) 가 ⁷⁾ vancomycin 150
 가 20000 1 , μg/Mℓ 가 ¹⁹⁾가 60μg/Mℓ
 9928 1 , vancomycin , 가
 가 25000 10mg/Mℓ ⁶⁾가 ,
 Gimbel ⁸⁾ 60μg/Mℓ
 8μg/Mℓ gentamicin 가 가 10mg/
 vancomycin 1mg Mℓ
 11748 . Mark ²⁰⁾
 10μg/Mℓ 30μg/Mℓ ofloxacin 3
 Gritz ¹³⁾ 140 가
 가 가 가 van-
 , 가 comycin ofloxacin, cephalirin
 , 60μg/Mℓ 10mg/Mℓ vancomycin, 2
 mg/Mℓ 5mg/Mℓ ofloxacin, 10mg/Mℓ 20mg/Mℓ
 cephalirin, 10mg/Mℓ vancomycin 5mg/
¹⁴⁾ Mℓ ofloxacin
 Gentamicin , 가 가 가
 vancomycin gentamicin ¹⁵⁾ Staphylococcus epider-
 midis^{2,4)} MIC90(minimal inhibitory

concentration) ofloxacin : 0.5mg/L²¹⁾, vancomycin : 1mg/L²²⁾, cephapirin : 16mg/L²³⁾

MIC

가

가

vancomycin

REFERENCES

- 1) Adenis JP, Robert RY, Mounier M, Denis F : Ant. chamber concentrations of vancomycin in the irrigating solution at the end of cataract surgery. J Cataract Refract Surg 23:111-114, 1997.
- 2) Kattan HM, Flynn HW Jr, Pflugfelder SC : Nosocomial endophthalmitis survey. current incidence of infection after intraocular surgery. Ophthalmology 98:227-238, 1991.
- 3) Menikoff JA, Speaker MG, Marmor M, Raskin EM : A case-control study of risk factors for post-operative endophthalmitis. Ophthalmology 98:1761-1768, 1991
- 4) Driebe WT Jr, Mandelbaun S, Forster RK, Schwartz LK, Culbertson WW : Pseudophakic endophthalmitis. Ophthalmology 93:442-448, 1986
- 5) Schneider DM, Gills JP, Oyarzun M : What specific means of antibacterial prophylaxis do you recommend before, during, and after routine cataract surgery? J Cataract Refract Surg 19:108-111, 1993.
- 6) Geroski DH, Hadley A, Edelhauser HF : Antibiotics in intraocular irrigating solutions ; effects on the corneal endothelium. ARVO abstracts 842-99. Invest Ophthalmol Vis Sci 35:1436, 1994.
- 7) Gills JP : Filters and antibiotics in irrigation solution for cataract surgery(letter). J Cataract Refract Surg 17:385, 1991.
- 8) Gimbel HV, Run R, DeBroff BM : Prophylactic intracameral antibiotics during cataract surgery : the incidence of endophthalmitis and corneal endothelial loss. Eur J Implant Refract Surg 6:280-285, 1994.
- 9) Dikstein S, Maurice DM : The metabolic bases to the fluid pump in the cornea. J Physiol 221:29-41, 1972.
- 10) Sherwood DR, Rick WJ, Jacob JS, Hart RJ, Fanchild YL : Bacterial contamination of intraocular and extra-ocular fluids during extra-capsular cataract extraction. Eye 3:308, 1989.
- 11) Dickey JB, Thompson KD, Jay WM : Anterior chamber aspirate cultures after uncomplicated cataract surgery. Am J Ophthalmol 112:278-282, 1991.
- 12) Ordan JL, John PT, Les OW, Martin FK, Michael JC : Half-time of intracameral gentamicin after phacoemulsification. J Cataract Refract Surg 14:883-888, 1997.
- 13) Gritz DC, Cevallos AV, Smolin G, Whitcher JP Jr : Antibiotic supplementation of intraocular irrigating solutions. Ophthalmology 103:1204-1209, 1996.
- 14) , Terrence P. O'Brien, : 가 가 . 39:125-130, 1998.
- 15) Campochiaro PA, Conway BP : Aminoglycoside toxicity-a survey of retinal specialist. Arch Ophthalmol 109:946-950, 1991.
- 16) Pflugfelder SC, Fliesler SJ, Pflugfelder ME, Forster RK : Intravitreal vancomycin. Arch Ophthalmol 105:831-837, 1987.
- 17) Cheung RPF, DiPiro JT : Vancomycin: an update. Pharmacotherapy 6:153-169, 1986.
- 18) Levine JF : Vancomycin: a review. Med Clin North Am 71:1135-1145, 1987.
- 19) Thomas DL, Lane DR : The effect of vancomycin on the corneal endothelium. Cornea 15:41-45, 1996.
- 20) Mark LM, Linda DH : The effect of ofloxacin on the human corneal endothelium. Cornea 16:209-214, 1997.
- 21) Chaudhry AZ, Knapp CC, Sierra-madero J, Washington JA : Antistaphylococcal activities of sparfloxacin(CI-978;AT-4140), ofloxacin, and ciprofloxacin. Antimicrob. Agents Chemother 34:1843-1845, 1990.
- 22) Del Bene VE, John JF Jr, Twitty JA, Lewis JW : Anti-staphylococcal activity of teicoplanin,

vancomycin, and other antimicrobial agents: the significance of methicillin resistance. *J. infect. Dis.* 154:349-352, 1986.

- 23) Mordenti JJ, Davis RH, Lammel CJ, Brooks GF : Title Bactericidal action of nafcillin, van -

comycin, and three cephalosporins against nafcillin-susceptible and nafcillin-resistant coagulase-negative staphylococci. *Diagnostic Microbiology & Infectious Disease.* 5:1-8, 1986.