PHA 5128

Answers Case Study 5
Feb 2009

1. J.S. is a 58 year old liver transplant patient at Shands hospital. After receiving 300 mg of cyclosporine as an IV infusion, the plasma trough level is 200 ng/mL and he seems to be doing fine. J.S. is ready for hospital discharge and the physician would like to convert IV dose of cyclosporine to PO for convenience. What oral dose should the patient receive and how often?

If 300 mg cyclosporine provides correct plasma levels, dose simply needs to be converted to oral dose (F = 0.3)

$$\text{New dose} = \frac{F_{current}}{F_{NewFormulation}} x \text{ Current dose}$$

$$= \left(\frac{1}{0.3}\right) \cdot (300mg) = \underline{1000mg / day}$$

Give 500 mg every 12 hours.

2. D.S., a 53 year-old, 70 kg male, was admitted to the coronary care unit with a diagnosis of heart failure, probable myocardial infarction (MI), and premature ventricular contractions (PVCs).
(a) What dose of lidocaine should you give immediately to achieve 3 mg/L in plasma and how fast should it be administered? (b) If your goal is to achieve steady state plasma lidocaine concentration of 2 mg/L for D.S., what should be the maintenance infusion rate? (c) D.S.'s PVCs were controlled by the bolus dose of lidocaine and the physician started the infusion rate from calculated from Part (b). However, fifteen minutes post infusion, PVCs were again noted. What might account for the reappearance of PVCs? What is an appropriate course of action at this point?

(a) LD = Vc*C/S = (0.3 L/kg*70 kg)* 3 mg/L /0.87 = 72 mg, Slow I.V push (25-50 mg/min)

(b) MD = CL*C/S = (0.36 L/hr/kg*70kg)*2 mg/L/0.87 = 58 mg/hr or 0.97 mg/min or 1 mg/min

(c) Distribution; give a second and third loading dose of 35 mg each

Note: Even though for lidocaine, Ideal body weight is preferred for calculating clearance (as shown in the lecture notes), total body weight can be used if the height was not given.

3. C.M. is a 45 year old male with hyperthyroidism. He has no previous major illness and is currently not taking other medications. He is 5'9 and weighs 170 lbs. The lab results show serum potassium = 4.7 mEq/L and serum creatinine = 0.7 mg/dL. (a) What is your recommendation for loading and maintenance dose for digoxin administered intravenously? (b) Three days later, C.M. came back with trough serum digoxin concentration of 1.2 ng/mL. The physician found this trough concentration level acceptable but wanted to convert the dose to PO, what is your recommendation? (c) He plans to have surgery next week to control his hyperthyroidism. Will there need to be a change in his PO digoxin dosage at that time? If so what should be the recommended dosage regimen and a follow-up TDM plan?

(a) IBW = 50 kg+9*2.3= 70.7 kg
Actual weight = 170 lbs/2.2 = 77.3 kg
CLcr = (140-45 yrs old)*77.3 kg/(72*0.7 mg/dL) = 146 mL/min
CL = 0.8*IDB+CLcr = 0.8*70.7 kg+146 = 203 mL/min = 12.2 L/hr
Vd = 3.8*IDB+3.1*CLcr = 3.8*70.7kg+3.1*146 mL/min =721 L

CL,hyperthyroid: 1.3*12.2 L/hr = 15.9 L/hr
Vd,hyperthyroid: 1.3*721 L = 937 L

LD = Vc,hyperthyroid*C= 937 L *1.5 ug/L= 1.41 mg IV
MD = CL, hyperthyroid*C*24 hr =15.9 L/hr*1.5 ug/L*24 hr = 0.572 mg/day IV

(b) LD = 1.41 mg/0.7 = 2.01 mg PO
MD = 0.572 mg/day/0.7 = 0.817 mg PO (or 0.750 mg PO)

(c) MD =12.2 L/hr*1.5 ug/L*24hr/0.7 = 0.627/day PO (or 0.500 mg PO)
or decrease dose by ~23%

4. A 20 kg 5 year old child has been taking Slo-Bid 200 mg Q12h at home. Upon arrival in the emergency department, the resident starts intravenous infusion of aminophylline at a rate of 1 mg/kg/h without a loading dose. Two blood samples were drawn for theophylline levels at one and eight hours after the start of infusion. The patient seems to be doing fine and the serum concentrations came back to be 1.2 and 5.9 µg/mL for the two time points, respectively.

a) Calculate this patient's theophylline clearance.
b) Is this patient's rate of theophylline metabolism faster, slower, or the same as an average 5 year old?

a)

$$CL = \frac{2 \cdot R_0}{(C_1 + C_2)} + \frac{2 \cdot Vd \cdot (C_1 - C_2)}{(C_1 + C_2) \cdot (t_2 - t_1)}$$

CL = 2*20*0.8/(1.2+5.9)+2*10*(1.2-5.9)/((1.2+5.9)*(8-1)) = 2.62 L/hr

Note for Ro, 1 mg/kg/hr at 20 kg is 20 mg/h and 0.8 is salt factor for aminophylline

b) Normal t1/2 = 4 hr =>>> CL = Ke*Vd = 0.693/t1/2*Vd = 1.73 L/hr ➔The patient's theophylline clearance is faster than that of a normal 5 year old