Community acquired pneumonia case study

Mr RK is a 44 years old gardener. His height and weight are 160cm and 60kg respectively. His calculated Body Mass Index (BMI) is 23. 44 and is within normal range. Mr RK was admitted to hospital with presenting symptoms of productive cough with yellowish sputum and fever. The symptoms started 5 days ago. Besides that, Mr RK also had following symptoms which are watery stool for 3 days, epigastric pain, nausea and vomiting. However, he has no any past medical history. As for his social history, he is a non smoker and non alcoholic. Mr RK is staying with his wife and children. He does not have any recent visits abroad. Furthermore, Mr RK has no relevant family history and drug history.

On examination, patient is alert and conscious. He had no hepatomegaly and ascites. His cardiovascular system examination shows dual rhythm no murmer whereas his respiratory system examination shows fine inspired crepitation. As for his vital sign, his blood pressure was 153/94mmHg, pulse rate was 100 beat per minute, respiratory rate was 30 per min, temperature was 38°C. His oxygen saturation was 96%. The early impression for Mr RK was community acquired pneumonia.

Further investigations were done and the abnormal result was noted as the table below.

Renal Profile

Day 1

Day 2

Day 3

Normal Range

Plasma Sodium

120 mmol/L ↓

126 mmol/L ↓

130mmol/L

↓
136-146 mmol/L

Plasma Potassium

2. 6 mmol/L ↓

2. 6 mmol/L ↓

3. 6mmol/L

3. 5-5. 1 mmol/L

Plasma Chloride

86 mmol/L ↓

89 mmol/L ↓

96 mmol/L

↓
98-107 mmol/L

Liver Function Test

Day 1

Day 2

Normal Range

Plasma Total protein

60 g/L ↓

62 g/L ↓

66-83 g/L

Plasma Albumin

21 g/L ↓

22 g/L ↓

35-52 g/L

A/G Ratio

0. 5 ↓

0. 6 ↓

0. 9 -1. 8

Plasma aspartate transaminase

1745 u/L ↑

1546 u/L ↑

<35 u/L

Plasma alanine transaminase

1500 u/L ↑

1408 u/L ↑

<45 u/L

Plasma Bilirubin

Day 1

Day 2

Normal Range

Plasma Total Bilirubin

109 µmol/L ↑

113 µmol/L ↑

5-21 µmol/L

Plasma Direct Bilirubin

72 µmol/L ↑

71 µmol/L ↑

0-5 µmol/L

Full Blood Count

Day 1

Normal Range

White Blood Cell

13. 8 x 109/L ↑

4-10 x 109/L

Red Blood Cell

4. 29 x 1012/L ↓

4. 5 -5. 5 x 1012/L

Haemoglobin

120 g/L ↓

130-170 g/L

Haemotocrit

0. 353 L/L ↓

0. 4-0. 5 L/L

Other Test

Day 1

Normal Range

Prothrombin Time

22 seconds ↑

11. 8-13. 7 s

Activated PTT

50. 6 seconds ↑

30. 6-43. 8 s

Lab Result

Sample :

Sputum

Cell count :

> 25polymorph/ low power fluid

Organisms :

Gram positive Cocci

Sample :

Blood

BFMP :

No malarial parasite seen

Hepatitis B surface antigen : non reactive

Anti hepatitis C :

non reactive

Hepatits A viral Ab IgM :

non reactive

Mr RK was start on intravenous(IV) Co-amoxiclav 1. 2g TDS, IV azithromycin 500mg OD for 3 days, IV metoclopramide hydrochloride 10mg stat, IV omeprazole 40mg OD, Tablet Paracetamol 1g TDS, IV Drip normal saline/24 hours(0. 9% sodium chloride), 5L oxygen face mask. Besides that, the management plan was to trace his chest x-ray, renal profile and correct electrolyte imbalance. Furthermore, medical staffs need to be aware if Mr RK experiences increase shortness of breath or oxygen saturation less than 95%.

His clinical progress was shown as table below.

Day 1

Patient Progress

Plan and Treatment

Shortness of Breath on/off

Mild Jaundice

Lung : Right basal crepitation

Random Blood Glucose:

2. 9 mmol/L at 7. 40am

8. 2mmol/L at 10am

12. 5mmol/L at 5pm

Raised in liver enzyme:

ALT – 1500

AST – 1745

Nasal Prong O2 3L/m

Off Paracetamol

Continue IV Co-amoxiclav 1. 2g TDS

Trace Chest x-ray

Mist KCl 15mls TDS for 3 days

Tablet Azithromycin 500mg OD

Random Blood Glucose monitoring hourly till night review

IV 1Ê˜ D10%/24h

IV Drip 2Ê˜ Normal Saline/24h with 1g KCl in each pint

IV Metoclopramide Hydrocholride 10mg TDS

Day 2

Patient Progress

Plan and Treatment

No Shortness of Breath

Mild Jaundice

Lung : Left basal crepitation

Liver enzyme elevated :

ALT – 1408

AST – 1546

Vital Sign :

BP -126/80

T -38 °C

PR -98/m

Random Blood Glucose:

11. 0mmol/L at 12 am

7. 1mmol/L at 6am

Off Co-amoxiclav

IV Ceftriaxone 2g stat, then 1g OD

Awaiting Blood Culture

Continue Antibiotic and IV Drip 2Ê˜ Normal Saline/24h with 1g KCl in each pint

Day 3

Patient Progress

Claims feels better

Decrease in temperature

No Shortness of breath

Tolerating Well

Productive cough with white sputum

No vomiting/diarrhoea

No abdominal pain

Mild Jaundice

Liver enzyme elevated :

ALT – 694

AST – 649

Vital Sign :

BP -120/80

T -37. 5 °C

PR -90/m

Random Blood Glucose : 6. 9mmol/L

CXR : Generalised haziness

Plan and Treatment :

– Off IV Drip

Day 4

Patient Progress

No Shortness of breath

Mild Jaundice

Still coughing and increase whitish sputum

Fever settled

Lung : fine crepitation more one left side

Vital Sign :

BP -113/73

T -37 °C

PR -87

Random Blood Glucose : 5. 3mmol/L

Plan and Treatment :

-Continue as planned previously

As a summary, Mr RK was diagnosed with community acquired pneumonia. During admission, he was febrile and experiencing vomiting, nausea and epigastric pain. Besides that, he had elevated liver enzyme and mild jaundice. However, this clinical case report will focused more on community acquired pneumonia.

Disease Overview and Pharmacological Basis of Drug Therapy

In developed countries, community acquired pneumonia (CAP) contributes to both morbidity and mortality. 1 A study shows that the mortality of CAP for Germany was 8% excluding data from healthcare associated pneumonia. 1 This mortality was at the same range as other European countries. 1 Another study show that in 2005 and 2006, the incidence of CAP need to be hospitalized was 2. 75 and 2. 96 per 1000 respectively. 2 The incidence is higher in males and is believed to be age related. 2 Age related incidence was proven when the data of patient over 60 over 2 years shows result of 7.

65 per 1000. 2 Factors affecting mortality in CAP include age, causative microorganism, antibiotic treatment and co-morbidities especially respiratory disease. 1 For example, if rare causative microorganisms such as Enterobacteriaceae and Pseudomonas aeruginosa are the cause of CAP, it increases the mortality due to the available guidelines which focus more on common causative organism. 1

According to British Thoracic Society, CAP is defined as having symptoms of an acute lower respiratory tract infection such as cough, new focal chest signs on examination such as crackles, and at least one systemic feature such as fever. 3 CAP is a lower respiratory tract disease due to infection of microorganism and disrupt the normal function of lungs. 4 The most common causative microorganisms are Streptococcus pneumoniae, Haemophilus influenza, Influenza virus A and B, Mycoplasma penumoniae, Chlamydia pneumoniae and Legionella species. 5, 6 It can be divided as typical such as Streptococcus pneumoniae and atypical such as Legionella species. 4 The occurrence depends mainly on age with atypical more common in young adults and typical more common in elderly. 4

The diagnosis of CAP first started with physical examination. Patients with CAP usually present with crackles on auscultation. 4 Tachypneic may be also sign of CAP. 4 Besides that, chest radiography should also be done to allow accurate diagnosis. 3, 4 Lobar consolidation and an increase in bilateral diffuse infiltrate are observed in chest radiography of CAP patient. 4 Laboratory test such as full blood count, liver function test, sputum test and urine test is also one way of diagnosis. 4 Lastly, patient oxygenation saturations should also be noted. 3

Treatment of CAP is based on severity assessment using CURB65 score which are confusion, urea, respiratory rate, blood pressure and age. 3 It is usually started with empirical antibiotics. 1 The aim of treatment is to eradicate the causative microorganism. 4 The empirical antibiotic that can be used in CAP are penicillins, cephalosporin, macrolide, tetracyclines and quinolones. 3 The key drugs used in this case are co-amoxicalv, azithromycin and ceftriaxone.

Co-amoxiclav is a combination of amoxicillin and clavulanic acid. 7 Amoxicillin is broad spectrum amino penicillin but not stable towards β-lactamase. 7 However, clavulanic acid, a β-lactamase inhibitor is added to overcome this issue. 7 Antibacterial spectrum of amoxicillin is enhanced because it has an amino group that ease the penetration to both gram negative and positive bacteria. 7 It has an effect on bacterial cell wall peptidoglycan synthesis by forming an ester bond with the transpeptidase enzyme. 8 This inhibits the further cross-linking of bacterial cell wall and triggers bacterial autolysin and cause lysis of the bacteria. 8 Hence, amoxicillin is bactericidal. 8

Ceftriaxone is a 3rd generation cephalosporins. 7 It acts in a similar way as penicillin which also interferes with the synthesis of bacterial peptidoglycan in cell wall. 8

Azithromycin is a macrolides that has an effect on translocation by inhibiting bacterial protein synthesis. 8 It bind to 50S subunit of the bacterial ribosome. 8 Azithromycin can be bactericidal or bacteriostatic depending on the concentration and type of microorganism. 8 It has similar antimicrobial

spectrum as penicillin and is an alternative anitibiotic for penicillin-sensitive patients. 8

Evidence for Treatment of the Conditions

According to British Thoracic Society, the antibiotic management of CAP is divided into CAP treated in community and hospital. 3 However, hospital treated CAP is discussed here. In order to start the treatment for hospital treated CAP, the severity of CAP should be measured. This is done with the CURB65. Most commonly, patient with CAP will start on empirical antibiotic. 3 In this case, the patient should be treated according to low severity CAP guidelines.

Mr RK was start on IV co-amoxiclav 1. 2g three times daily and IV azithromycin 500mg once daily for 3 days for his CAP. British Thoracic Society suggests that patient in low severity CAP should start with oral empirical antibiotic except where oral therapy is contraindicated. 3 Mr RK is start on intravenous antibiotic instead of oral antibiotic because he is vomiting.

Furthermore, combination of clavulanic acid and amoxicillin is used instead of amoxicillin alone. This combination is better as it decreases the beta lactamases available which will inactivate amoxicillin., 7, 8, 9 Besides that, a double-blinded clinical trial comparing oral moxifloxacin with high-dose amoxicillin in treatment of CAP shows that there is same effectiveness for suspected Streptococcus pneumonia CAP. 10 This clinical trial involves 400 adults suspected with CAP and is given either moxifloxacin 400mg once daily or amoxicillin 1000g three times a day with ratio 1 to 1. 10 The results shows

that, the cure rate was 87. 8% for both. 10 Hence either amoxicillin or moxifloxacin can be used as empirical antibiotic treatment for this patient. Another study on cost effectiveness comparing co-amoxiclav and clarithromycin also shows that co-amoxiclav has higher cure rate and lower cost compare to clarithromycin. 11 The study conclude that when cure rate shown for co-amoxiclav and clarithromycin are 88. 7% and 82. 4% respectively. 11

Further study comparing efficacy of amoxicillin and cefuroxime and clarithromycin in treatment of CAP shows that amoxicillin was the most effective. 12 This study is carried out in 3 groups and 97% of clinical improvement was seen for both group receiving amoxicillin and clarithromycin respectively whereas 95% for another group receiving cefuroxime. 12 For the use of IV azithromycin, it was supported by a study that stated combination used with azithromycin can reduce the mortality of CAP. 13