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Case Report

Stenotrophomonas Maltophilia Pneumonia In A Patient With End-Stage Renal Disease On Hemodialysis: Case Report.

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Abstract

Introduction: ESRD culminates from various pathophysiologic processes leading to progressive renal dysfunction. Progressive decline in GFR stems from genetic abnormalities, Immune complex depositions, inflammation, and toxins, in which a dysregulated immune response and lack of protective mechanisms cause immune impairment. ESRD patients on hemodialysis require utmost clinical care, a high index of suspicion of infection, and meticulous follow-up of clinical deterioration.

Case Description: A 42-year-old male with End Stage Renal Disease, Type 1 Diabetes Mellitus, Hypertension, and Hypothyroidism presented with a 1-week history of productive cough, fever, difficulty breathing, and loss of appetite. Physical exams, laboratory, and imaging findings were suggestive of community-acquired pneumonia. Culture from the pleural fluid grew *Stenotrophomonas maltophilia* susceptible to TMP/SMX, Levofloxacin, Ceftazidime, and Minocycline. He was treated with Levofloxacin with a good clinical outcome.

Discussion: Stenotrophomonas maltophilia is a gram-negative, rod-shaped obligate aerobe that persists in a harsh environment, causing both hospital-acquired as well as community-acquired infections. With the greater tendency of resistance to elimination by the host's immune system, anti-microbials and antiseptic solutions contribute to the increased prevalence of its infection, along with the pathogenic virulence in patients with CKD undergoing hemodialysis. Drug susceptibility testing is of paramount importance pertaining to the antibiotic selection.

Conclusion: CKD patients are prone to opportunistic infections due to the weakened immune system and frequent hospitalizations. S maltophilia is among the rare causes of pneumonia and bacteremia in CKD patients undergoing hemodialysis, mandating drug susceptibility testing and rational antibiotic selection.

Keywords: CKD- chronic kidney disease,eGFR- Estimated Glomerular Filtration Rate,ESRD-End-Stage Renal Disease,TMP/SMX-Trimethoprim/ Sulfamethoxazole,S. *maltophilia- Stenotrophomonas maltophilia*

INTRODUCTION

Chronic Kidney Disease Is A Spectrum Of Clinical Syndromes Resulting From Pathophysiological Processes And Laboratory Abnormalities Coupled With Progressive Decline In Glomerular Filtration Rate (Gfr). It Is Defined As Estimated Glomerular Filtration Rate (Egfr) Less Than 60ml/Min/1.73m2 And/Or Objective Evidence Of Kidney Damage As Evidenced By Albuminuria (Urine Albumin To Creatinine Ratio >30mg/G) For At Least 3 Months As Defined By Kidney Disease Improving Global Outcomes (Kidgo) (1). End-Stage Kidney Disease Is Defined As Egfr<15ml/Min/M2, Mandating Renal Replacement Therapy. Esrd Culminates From Various Pathophysiologic Processes Leading To Progressive Renal Dysfunction. Progressive Decline In Gfr Stems From Genetic Abnormalities, Immune Complex Depositions, Inflammation, And Toxins, In Which A Dysregulated Immune Response And Lack Of Protective Mechanisms Cause Immune Impairment (2). Other Mechanisms Include Hyperfiltration And Hypertrophy Of The Renal Functioning Units (Nephrons), Contributing To The Distortion Of Glomerular Architecture And A Decrease In Size. Complications Of Ckd Include Anemia, Mineral Bone Diseases, Electrolyte And Acid/Base Disturbances, And Hyperuricemia.

Stenotrophomonas Maltophilia (Greek: Stenos (Narrow), Trophos (Feeding), Monas (Unit) Malt, Old English: Malt;

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Philos, Greek: Friend) Is A Water-Borne, Gram-Negative, Obligate Aerobe, Non-Lactose-Fermenting, And Opportunistic Pathogen That Dwells Both In Community And Healthcare Settings. The Risk Factors Include Malignancy, Chronic Illness, The Presence Of Indwelling Venous Catheters, And Immunocompromising Conditions (3). S. Maltophilia Causes Bacteremia, Pneumonia, As Well As Bone And Soft Tissue Infections. Temporary As Well As Permanent Venous Catheters Are The Primary Entry Points For The Pathogens, As They Are Frequently Used To Provide Access During Hemodialysis Sessions, Though The Temporary Venous Catheters Are At Increased For Harboring The Organism Than The Permanent Catheters (4).

The Pathogens Causing Bacteremia Are Apparently Acquired During Or After Hospitalizations In The Setting Of The Above-Mentioned Risk Factors. Patients With S. Maltophilia Pneumonia Can Present With Fever, Chills, Malaise, Loss Of Appetite, Cough, To Severe Life-Threatening Manifestations Such As Shock And Multiorgan Failure Syndromes. Investigations Are Focused On Diagnosing The Focus Of Infection, Identifying The Causative Microbe, Categorizing The Severity, And Assessing Remission. Esrd Patients On Hemodialysis Require Utmost Clinical Care, A High Index Of Suspicion Of Infection, And Meticulous Follow-Up Of Clinical Deterioration As Untreated Infections Of S. Maltophilia Progress To Septic Shock And Death, With Spiking Mortality Reaching 14-69% (3,5). Community-Acquired Pneumonia Caused By The Pathogen Is Not Commonly Reported, For Which We Present A Case Of A Patient With Ckd On Hemodialysis Who Presented With Cough And Fever, Treated For Pneumonia After *Stenotrophomonas Maltophilia* Was Isolated From The Pleural Fluid Culture Sample.

CASE PRESENTATION

A 42-Year-Old Male With End Stage Renal Disease, Type 1 Diabetes Mellitus, Hypertension, And Hypothyroidism Presented With A 1-Week History Of Productive Cough, Fever, Difficulty Breathing, And Loss Of Appetite. He Has No History Of Chest Pain, Allergies, Smoking, Chronic Respiratory Conditions, Or Contact With A Chronic Cougher. He Has Been A Known Ckd With Anemia Patient For The Past 1 Year On Follow-Up, And Subsequently, He Started Maintenance Hemodialysis Twice Weekly 2 Months Ago With Parenteral Iron And Erythropoietin Therapy. He Has Type 1 Diabetes Mellitus For The Past 15 Years On Insulin Glargine 16 Iu Daily With Fair Glycemic Control. He Has Hypertension For Which He Is On Amlodipine And Enalapril 10mg And 5mg Orally Daily, Respectively, With Good Blood Pressure Control. He Has Also Been Hypothyroid For The Past 1 Year On Levothyroxine 100mcg Orally Daily.

On Physical Exam, He Looks Acutely Sick. Vital Signs Showed Blood Pressure 110/60, Pulse Rate Of 105, Respiratory Rate 22, And Oxygen Saturation 93% With 2 L Of Intranasal Oxygen Supply. He Has Slightly Pale Conjunctivae. On Chest Exam, He Has Bilaterally Decreased Chest Expansion, Absent Tactile Fremitus, And Bronchial Breath Sounds And Coarse Crepitations Over The Right Posterior Middle Aspect Of The Lungs; There Was Also Absent Air Entry Over The Posterior Basal Aspect Of The Lungs. The Central Venous Catheter Is In Situ, Functional With No Abnormal Discharges. Other Examinations Were Normal.

A Bedside Ultrasound Showed Bilateral Massive Free Fluid Over The Bilateral Lung Zones. An Ultrasound-Guided Diagnostic And Therapeutic Tap Was Performed And Sent For Analysis, Including Gram Stains, Culture With Sensitivity, And Cytology. Chest X-Ray Showed Pneumonia. High-Resolution Chest Ct Scan Showed Left Upper Lobe Anterior Segment Consolidation, Bilateral Massive Pleural Effusion With Adjacent Segmental Atelectasis, And Right Central Catheter In Situ. With This, He Was Investigated With Complete Blood Count, Serum Chemistry, And Blood Culture. The Complete Blood Count Showed A White Blood Cell Count Of 6,000 With 73.2% Neutrophil, Hemoglobin 8.6, And Platelets 369,000. Serum Creatinine Was 12.16, And Urea Was 107.6. Liver Function Tests Are Within Normal Parameters. Pleural Fluid Analysis Showed A Turbid Appearance, Wbc 1396 With 96.6% Mononuclear Cells, Protein 3.01, Glucose 154.7, And Ldh 137.7. Afb, Gene X-Pert, And Gram Stain Were Negative. Pleural Fluid Culture Demonstrated Stenotrophomonas Maltophilia Sensitive To Trimethoprim/Sulfamethoxazole, Levofloxacin, Ceftazidime, And Minocycline. Blood Culture Demonstrated No Growth. With The Assessment Of Community Acquired Pneumonia, He Started Levofloxacin. Subsequently, He Showed Good Clinical Progress And Continued To Follow Up.

Figure 1. Plain Radiography Showing Consolidation And Effusion

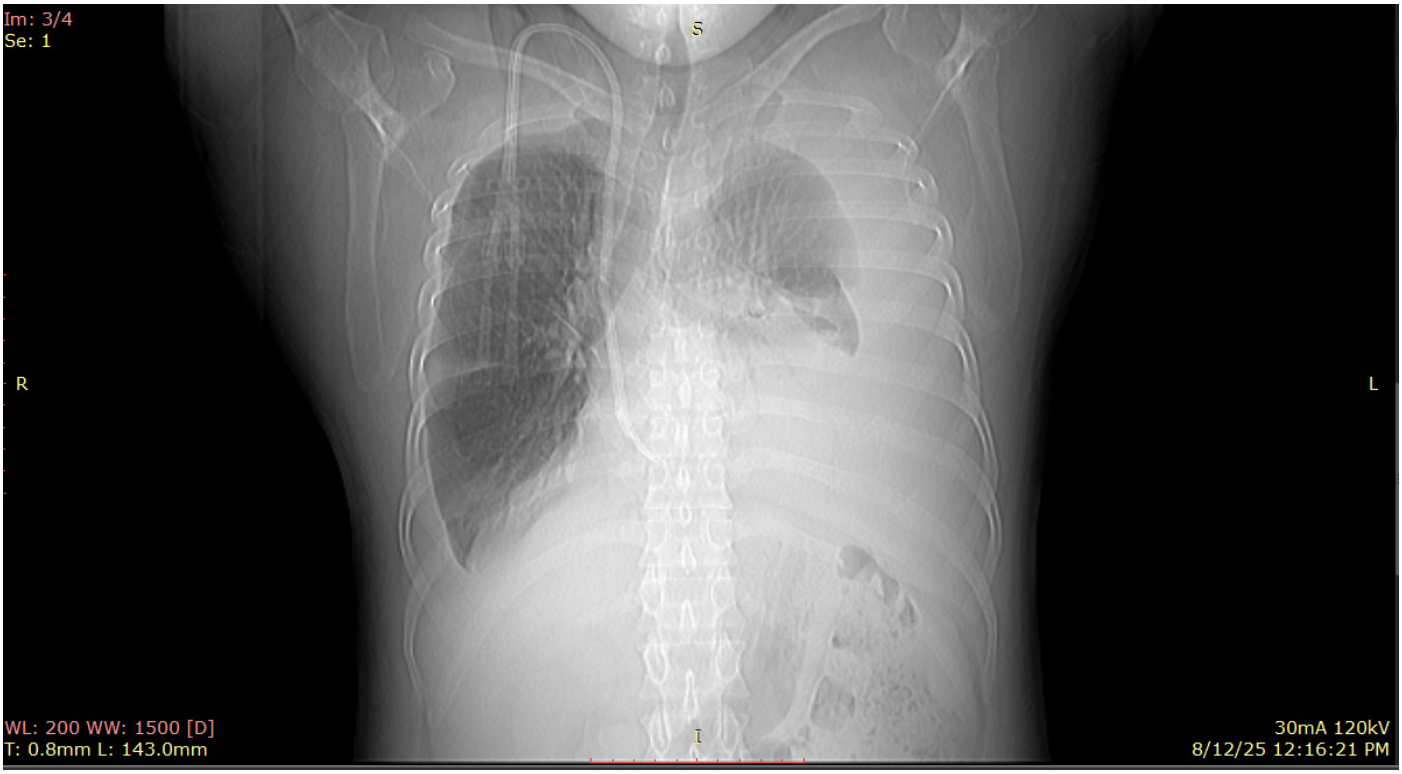
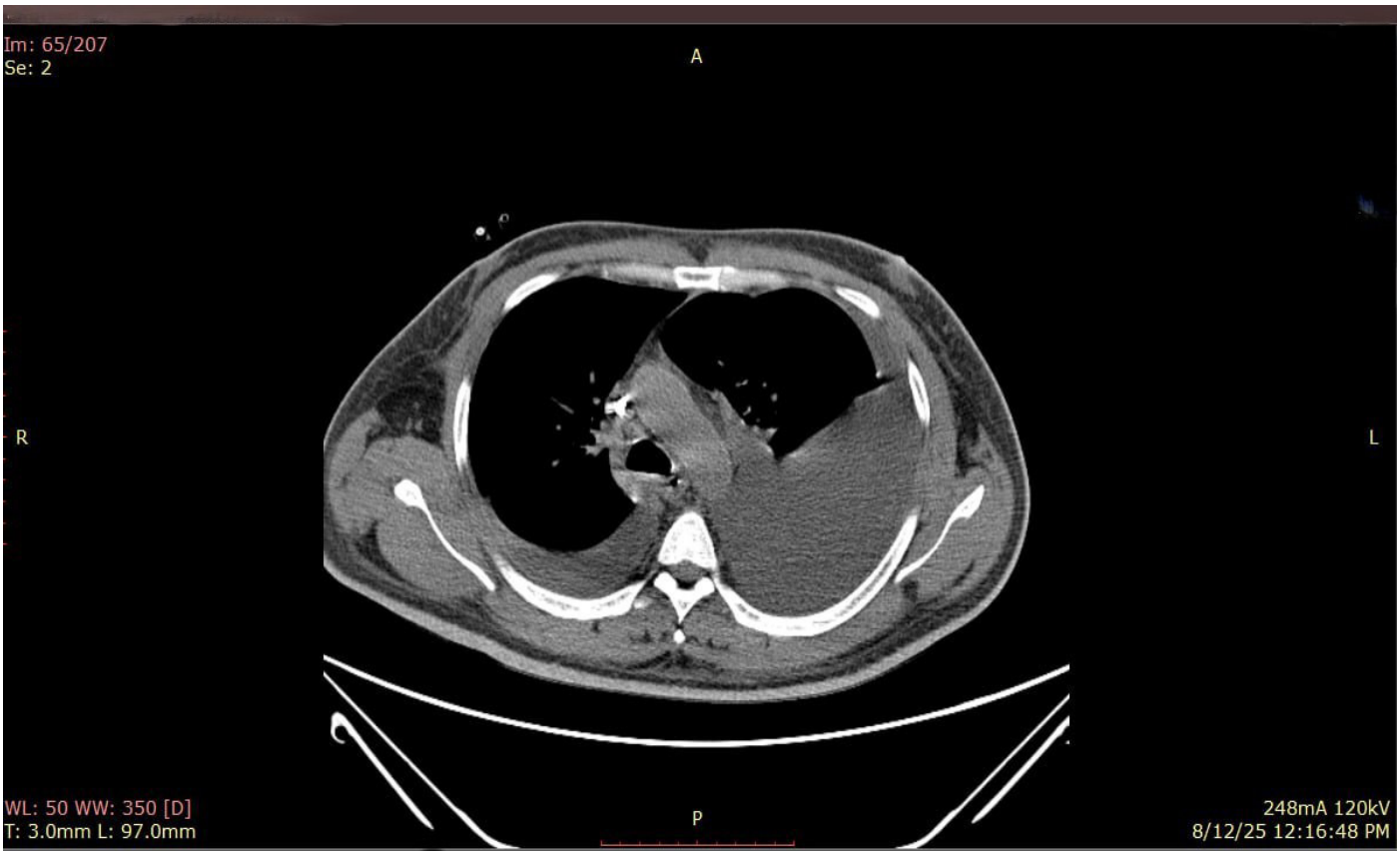
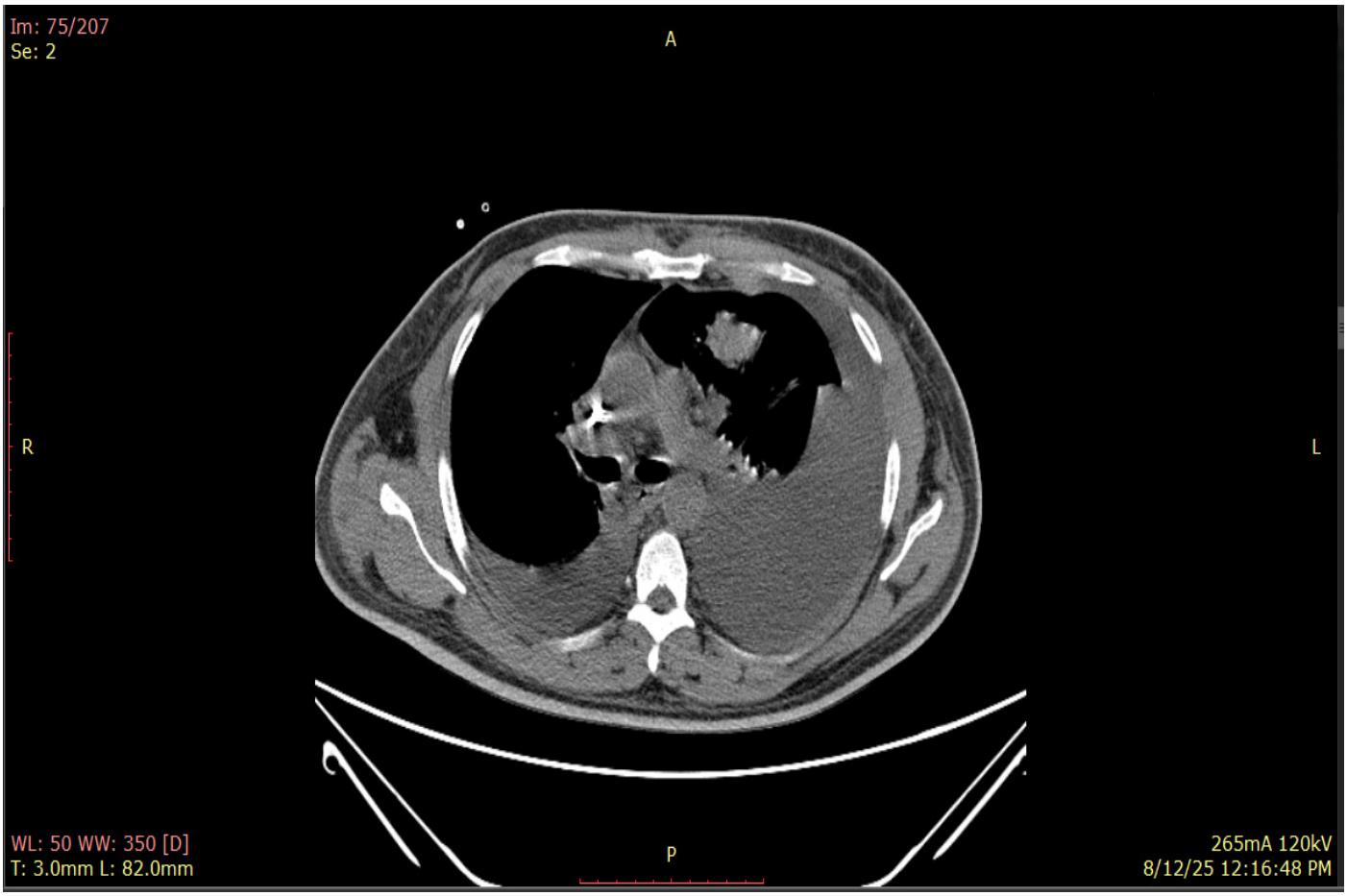


Figure 2-6. High-Resolution Chest Ct Scan Showing Consolidation And Massive Effusion

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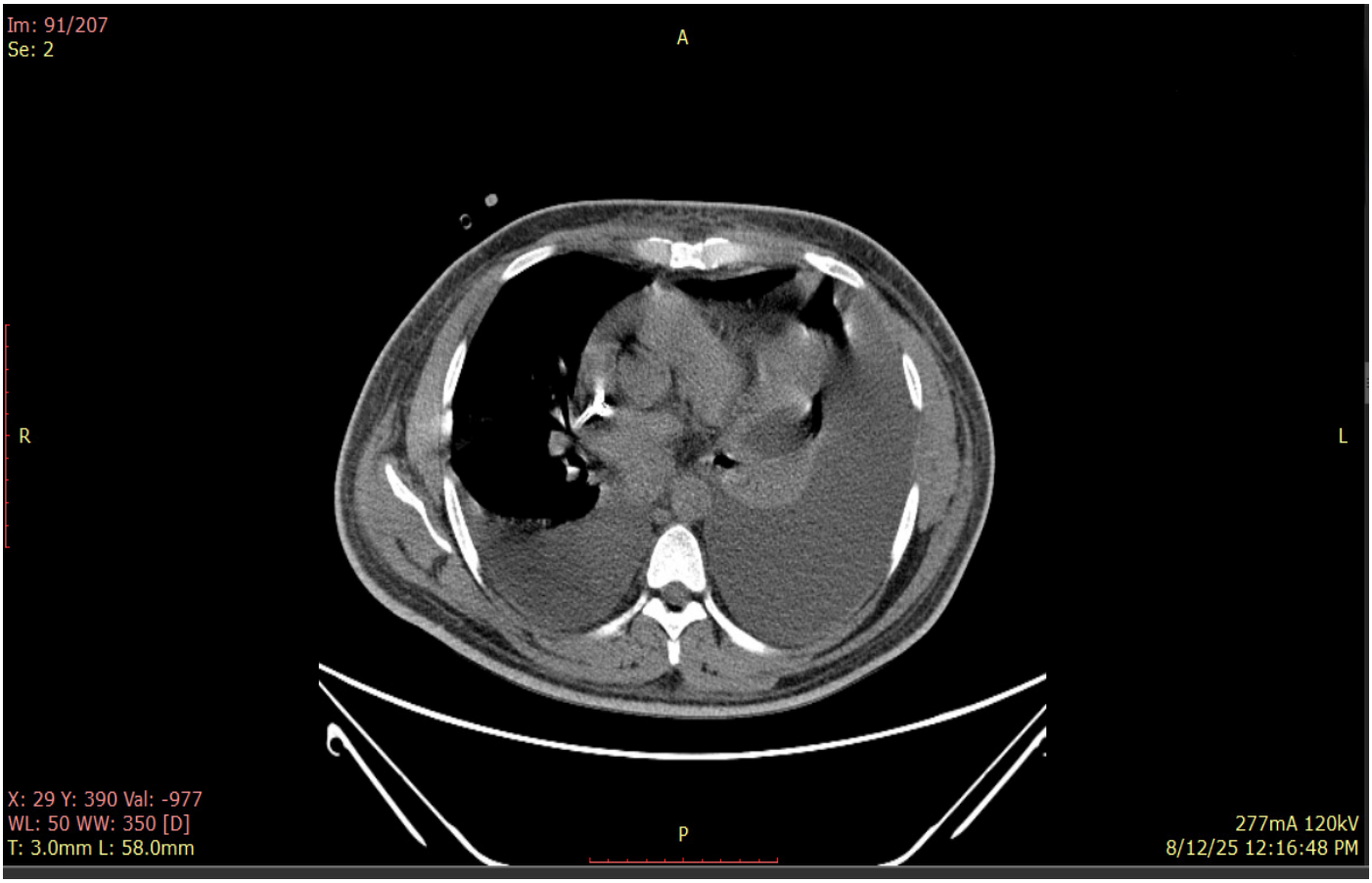
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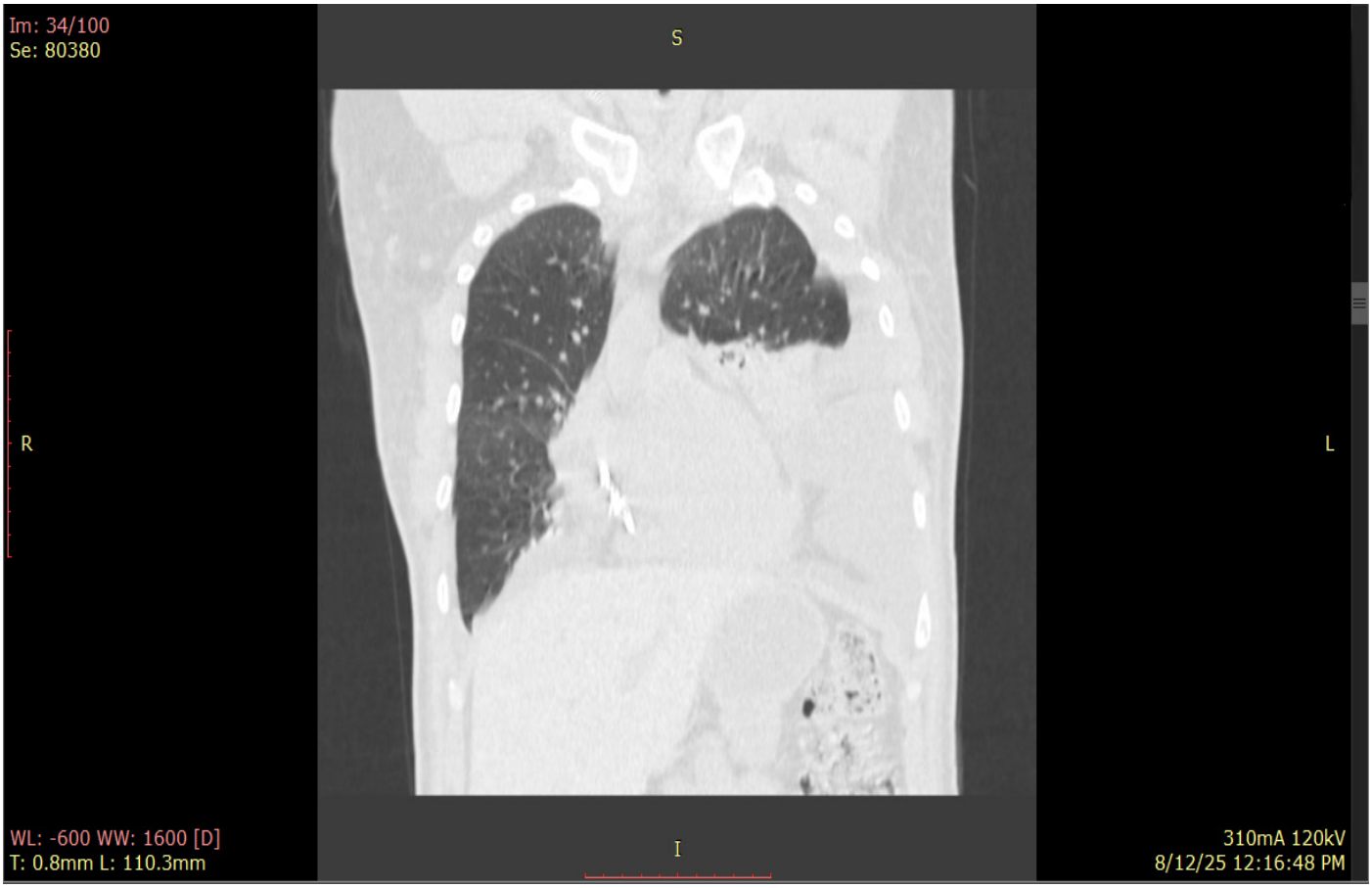
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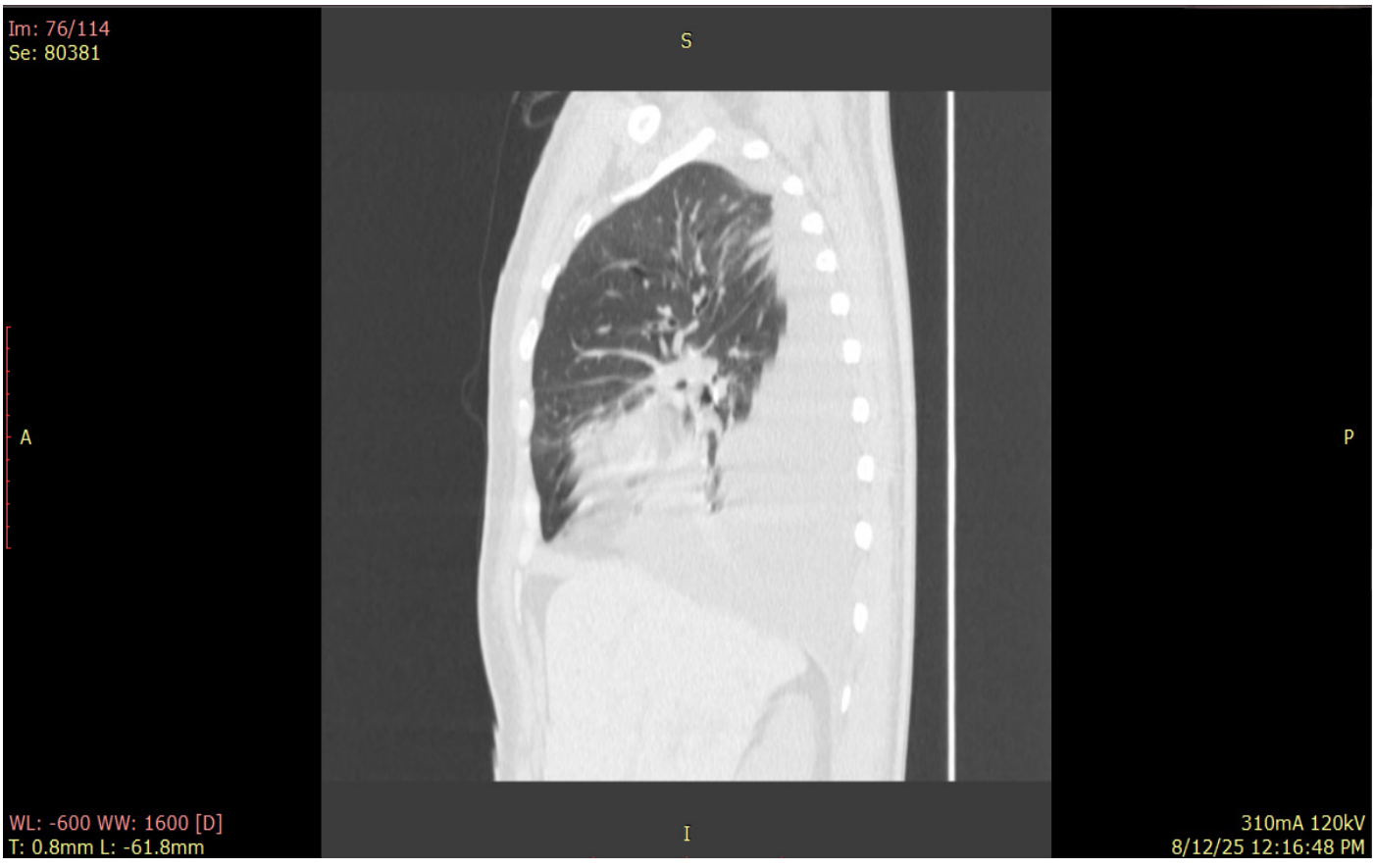
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DISCUSSION

Stenotrophomonas maltophilia is a gram-negative, rod-shaped, non-lactose-fermenting, and opportunistic obligate aerobe that persists in a harsh environment, causing both hospital-acquired as well as community-acquired infections (3). The organism was first taxonomically categorized as *Pseudomonas maltophilia*, then after to *Xanthomonas maltophila*, to finally as *Stenotrophomonas maltophilia* after PCR amplifications of 16S rRNA variants of the Xanthomonas genus isolated a separate entity with distinct characteristics (6). The pathogen commonly thrives on wet media, preferring water drainage systems, dialysis water treatment systems, infected antiseptic solutions, and plastics to commonly harbor both in the community and healthcare facility settings due to the tendency to form biofilms (5,7).

Patients with ESRD on maintenance hemodialysis are commonly prone to develop infection since the prevalence of strains of S. *maltophilia* in dialysate solutions of hemodialysis units accounted for 13.5% (8). As the organism gets access through venous catheters and spreads through hematogenous spread, it can involve multiple organ systems, causing a wide range of infections, such as bacteremia, pneumonia, endocarditis, urinary tract infections, bone and soft tissue infections, as well as endophthalmitis (9). Our patient is on regular hemodialysis twice weekly via central venous catheter, and the risk factor and mode of vascular access can explain the patient's clinical presentation. Immunocompromised patients, chronic kidney disease with end-stage renal disease patients undergoing hemodialysis, and patients with hematologic malignancies, transplant patients are prone to being infected by *Stenotrophomonas maltophilia*. With the greater tendency of resistance to elimination by the host's immune system by forming biofilms, anti-microbials and antiseptic solutions contribute to the increased prevalence of its infection, along with the pathogenic virulence in patients with ESRD undergoing hemodialysis (5,10). It can cause both community-acquired as well as hospital-acquired pneumonias. More than half of respiratory tract isolates of S. maltophilia are in hospitalized patients (11). Only a few cases of community-acquired pneumonia have been reported in patients with a background of aspiration, cardiac, and respiratory chronic comorbid settings (9,12). One of the first ever reported cases was a patient with bronchiectasis who presented with clinical evidence of pneumonia, and the strain of S. *maltophilia* was cultured from the sputum sample (12). Our patient has no history of aspiration, chronic respiratory (like bronchiectasis) or cardiac conditions as well or recent hospitalizations. He has typical clinical presentations of community-acquired pneumonia caused by S. *maltophilia*. In addition, there are no reported cases of S. *maltophilia* being isolated from pleural fluid samples.

Based on clinical presentations and physical exam findings, focused investigations are crucial at diagnosis, severity staging, treatment plan, as well as for prognostication purposes. The treatment of S. *maltophilia* bacteremia is guided by culture and sensitivity testing, typically involving dual antibiotic therapy and removal of the central venous catheter to enhance the synergistic effect of the selected antibiotics (7). In our patient's case, the strains were sensitive to Levofloxacin, TMP/SMX, Minocycline, and Ceftazidime, with favorable treatment outcomes after being treated with Levofloxacin and catheter management. S. *maltophilia* is resistant to many antimicrobials in terms of acquiring adaptive resistance patterns by target alteration, multiple efflux pumps, enzymatic inactivation, as well as genetic acquisition from other bacteria by horizontal gene transfer, rendering the pathogens' virulence, biofilm formation, and survival in extreme environmental conditions (10). The resistance mechanisms contribute to the emergence of high resistance rates against first-line antibiotics, such as TMP/SMX, as high as 30% (5,13). Drug susceptibility testing is of paramount importance pertaining to the antibiotic selection as it not only provides the appropriate antimicrobials, but also helps to characterize the behavior of the isolated strain towards the antibiotics (10).

Stenotrophomonas maltophilia is a ubiquitous and highly virulent opportunistic microorganism causing a wide array of clinical deterioration ranging from severe bacteremia to sepsis to septic shock and death. Respiratory tract involvement leads to significant mortality (14). It mandates the timely identification of the infection via proper patient evaluation and investigation. Blood and body fluid cultures are indispensable tools for diagnosis, drug susceptibility testing, and monitoring clinical progress. Additionally, regular inspection of the dialysis water treatment systems and hemodialyzers is an important measure of prevention in hemodialysis units.

CONCLUSION

We present a case of a known CKD patient for the past 15 years, undergoing hemodialysis for 2 months, presenting with fever and productive cough, evaluated and investigated to have *Stenotrophomonas maltophilia* pneumonia, and treated with the antibiotics for which the strain is susceptible. CKD patients are prone to opportunistic infections due to the weakened immune system and frequent hospitalizations. S *maltophilia* is among the rare causes of pneumonia and bacteremia in CKD patients undergoing hemodialysis, with high rates of resistance to the conventional antibiotics mandating drug susceptibility testing and rational antibiotic selection. Finally, we asserted possible ways to prevent the occurrence of the infection.

Conflict Of Interest: None.

Patient Consent: Written informed consent was obtained from the patient.

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