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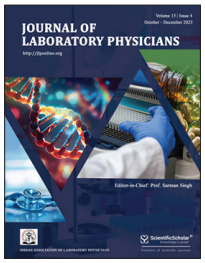
Journal of Laboratory Physicians



*Case Series*

# *Escherichia coli* in medicolegal autopsy causing symmetrical peripheral gangrene and psoas abscess

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Received: 14 June 2024
Accepted: 27 December 2024
EPub Ahead of print: 03 February 2025
Published: 08 April 2025

**DOI**
10.25259/JLP_100_2024

**Quick Response Code:**

## ABSTRACT

Postmortem microbiology (PMM) plays a crucial role in identifying infectious causes of death, which have significant legal and clinical implications. Not only determining the cause of death, PMM is vital in identifying infectious pathogens providing valuable medical insights. This case series presents two medicolegal autopsy cases where *Escherichia coli* infections led to rare and severe complications: Symmetrical peripheral gangrene (SPG) and psoas abscess. The first case involves a 28-year-old female hospitalized for 35 days after allegedly consuming sedatives. Postmortem findings included gangrene in her hands and feet and extensive lung consolidation with pus nodules. Blood cultures identified *E. coli*, while lung swabs revealed *Klebsiella pneumoniae* and *Candida* spp. The second case involves a 32-year-old female experiencing abdominal pain and breathing difficulties who died en route to the hospital. The autopsy revealed congested lungs and a psoas abscess, with blood cultures confirming *E. coli* infection. *E. coli*, typically associated with urinary tract infections, can cause severe complications such as SPG and psoas abscess. SPG involves ischemic damage to extremities without central vessel occlusion, often linked to septicemia and disseminated intravascular coagulation. Psoas abscesses result from hematogenous spread or direct extension from adjacent structures. These cases highlight the need to consider atypical pathogen presentations in critically ill patients. Recognizing *E. coli's* potential for rare, fatal complications emphasizes the importance of thorough microbiological analysis during autopsies to improve diagnostic accuracy, guide clinical management, and inform public health strategies. Integrating PMM into routine autopsy protocol is essential for advancing medical and forensic knowledge.

**Keywords:** Autopsy, *Escherichia coli*, Gangrene, Microbiology, Psoas abscess

## INTRODUCTION

Forensic pathologists and microbiologists share the goal of identifying an infectious cause of death (COD) utilizing post-mortem microbiology (PMM), which is also the common goal in both clinical and forensic autopsies. Furthermore, COD in a forensic context might have legal ramifications. Even with the advancements in the identification and treatment of infectious diseases, infections remain a significant cause of unexpected fatalities. Forensic investigations are conducted into these deaths in the majority of medicolegal systems.[1] In medicolegal autopsy, PMM is an essential ancillary investigation for determining any infectious pathology linked to the COD, which is necessary for confirmation of the antemortem diagnosis and identification of the etiologic agent as the source of an infection that had not been identified before.[2] *Escherichia coli* is the leading cause of bloodstream infections (BSIs) in high-income countries, accounting for about 27% of BSI cases.[3] Microorganisms, whose isolation in a blood culture bottle nearly always (>90%) represent true bacteremia or fungemia, include *Staphylococcus aureus, Streptococcus*

*pneumoniae, E. coli*, other members of the family *Enterobacteriaceae, Pseudomonas aeruginosa,* and *Candida albicans*.[4] *E. coli* sepsis-related bacteremia is a severe issue for infections acquired in both hospitals and the community.[5] Polymicrobial infections are known to have a higher incidence of septic shock. Polymicrobial BSIs are most frequently seen in the intensive care unit, and the organisms causing these infections have more excellent multidrug resistance.[6]

Since *E. coli* is the most prevalent cause of bacterial BSIs, these infections are linked to a significant disease burden.[7] Bacterial invasion brought on by the presence of lipopolysaccharides (LPS), which are present on the outer membrane of Gram-negative bacteria such as *E. coli* and fimbriae, promotes adhesion and local inflammation. During bacteremia, LPS can connect with Toll-like receptor 4, which triggers a systemic inflammatory response.[8] Few studies have focused exclusively on the role of *E. coli* infections in systemic illnesses like sepsis. Intestinal diseases such as watery or bloody diarrhea are the most common cause of *E. coli* infections. Sepsis in hospitals and communities is mainly caused by pathogenic *E. coli* colonization and infection of extraintestinal sites.[9] The occurrence of both symmetrical peripheral gangrene (SPG) and psoas abscess due to *E. coli* is rarely a postmortem diagnosis. This report presents two medicolegal autopsy cases involving *E. coli* infection that led to these unusual and severe manifestations. By highlighting these cases, we aim to shed light on the possible pathways and risk factors for such atypical presentations, underscore the importance of timely diagnosis and intervention, and discuss the implications for clinical and forensic practice.

## CASE SERIES

### Case 1

A 28-year-old married female who was on prescribed medication for depression allegedly consumed sedative tablets at her home. She was hospitalized for 35 days until she was declared dead. During treatment, she developed persistent fever, raised white blood cell count, anemia, and thrombocytopenia. The blood culture was reported sterile, 2 weeks before death. She received meropenem, doxycycline, and polymyxin during hospitalization. However, the condition worsened, and she was subsequently declared dead. The body was kept in cold storage for 19 h, and then, a postmortem examination was conducted 22 h after death. The autopsy was completed in 1 h 15 min. On external examination, the face was swollen, with blackening of the tip and left ala of the nose, and surgical dressing on the hands. Underneath, both hands were swollen. Black discoloration, degloving of the skin of the hands, and foul smell suggested gangrene [Figure 1a and b]. Both feet were swollen with black discoloration of the feet and a foul smell emanated, suggesting gangrenous feet [Figure 2a and b].

Multiple pus nodules were seen in both lungs, which were consolidated [Figure 3] with 1-liter straw-color fluid in the peritoneal cavity. The liver weighed 1824 g with yellowish discoloration, and the weight of the right and left kidneys was 190 g and 172 g, respectively. Blackish discoloration of both kidneys was seen on the surface on gross examination at autopsy. On cut-section, corticomedullary junction demarcation was lost. Peripheral blood samples were taken aseptically in FA Plus blood culture bottles (bioMerieux, Marcy l'Etoile, France) from a subclavian vein and incubated in the BacT/Alert®-3D (bioMerieux, Marcy l'Etoile, France) which ultimately grew *E. coli*. A pus swab from the lungs was also taken, which grew *Klebsiella pneumoniae* and fungal hyphae suggestive of *Candida* spp. The micro-organisms were identified using the Viv Technology (VITEK)®-2 (bioMerieux, Marcy l'Etoile, France) microbial identification system.

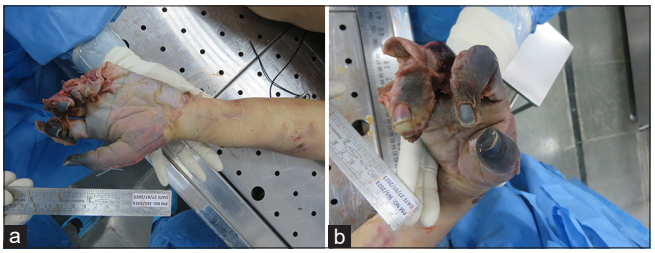


**Figure1:** (a and b) Blackish discoloration of both the feet.

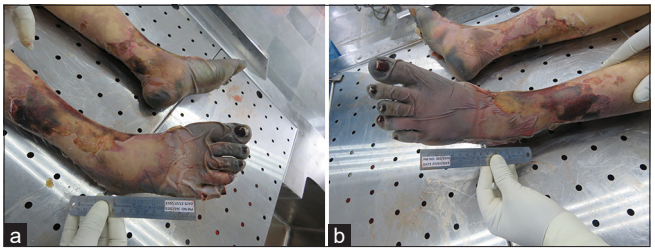


**Figure 2:** (a and b) Blackish discoloration of both the hands.

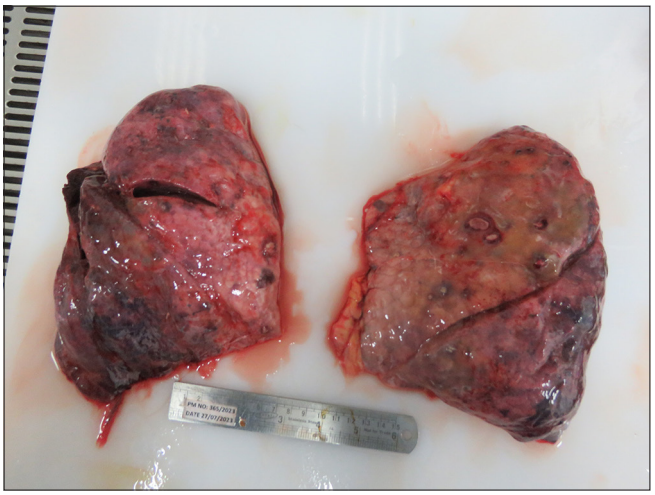

**Figure 3:** Multiple pus nodules in both lungs.

### Case 2

A 32-year-old female with an alleged history of abdominal pain and difficulty in breathing for a few days, which worsened, was brought to the hospital but expired on the way and was declared dead on arrival. She was autopsied the next day. No prior clinical evaluation was done, so no related medical record was available. A postmortem examination was conducted 32 h after keeping the body in cold storage for 20 h. The autopsy was completed in 1 h 25 min. On external examination, the face was congested; the body was pale, with blood-tinged fluid oozing out from the mouth. Both lungs were congested, edematous, and consolidated. Multiple fluid-filled cysts were present over the right kidney. Both the kidneys were pale on cut and the corticomedullary junction was well-demarcated. An abscess involving the left psoas muscle and the paravertebral muscle is shown [Figure 4a and b]. Pus samples and peripheral blood were collected aseptically separately for microbiological analysis. The pus sample demonstrated fields full of pus cells under an oil immersion lens on Gram staining and *E. coli* grown in culture. Peripheral blood culture grew *E. coli*.

In both cases, the blood samples were collected from the subclavian vein. When collecting peripheral blood, the subclavian vein is better than the femoral veins as the subclavian veins are farther from the gut and less likely to have bacteria due to transmigration from the gut. Only when peripheral blood is unavailable should cardiac blood be drawn since, during autopsy, the thoracic cage is exposed to exploration, which may cause contamination.[10] In both cases, peripheral blood cultures grew *E. coli*. Tissue and blood cultures taken during the postmortem examination should be obtained within 24–48 h after death to prevent contamination and postmortem translocation. In addition, before extracting the sample from an organ such as the lungs or the spleen, the body locations chosen for culture must be disinfected, for example, with an iron or soldering spatula.[11] In both cases, the blood samples were collected from the subclavian vein within 48 h of death after cleaning the external surface with rectified spirit before dissecting the body.

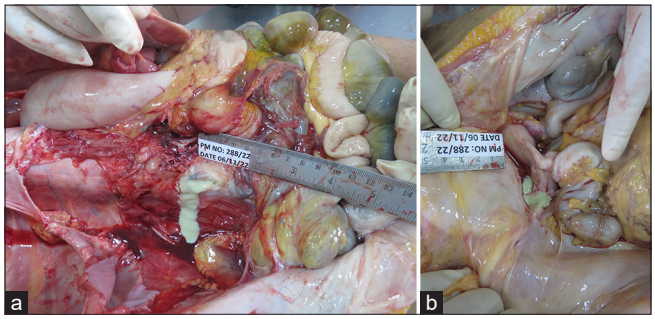


**Figure 4:** (a and b) Abscess of psoas muscle and paravertebral muscles.

## DISCUSSION

*E. coli* is the most frequent cause of bacteremia in England, accounting for 50.7 cases per 100,000 individuals.[12] SPG is a rare clinical syndrome characterized by symmetric ischemia associated with gangrene of distal extremities and certain other parts. This occurs in the absence of primary vaso-occlusive disease, thus making it essentially a diagnosis of exclusion. Several infective and non-infective causes have been linked with this disease, such as sepsis, myeloproliferative diseases, and hyperviscosity conditions. Mortality rates of up to 40% have been reported. A case of a 40-year-old male with SPG associated with *E. coli* has been reported and was managed successfully with antibiotics and anticoagulants along with supportive care.[13] However, in the first case of this case series, the patient expired after prolonged hospitalization. *K. pneumoniae* and fungal hyphae were demonstrated in lung samples. The sedative overdose could have led to decreased consciousness, which could have facilitated *Klebsiella pneumonia*-associated aspiration pneumonia. The prolonged hospitalization could have possibly caused a secondary infection associated with *E. coli*. In addition, a polymicrobial infection is considered fatal and common in prolonged hospitalized cases. Prolonged hospitalization and broad-spectrum antibiotic therapy can lead to nosocomial fungal infections.[14]

Psoas abscesses from genitourinary tract infections have been reported in the literature.[15] Primary abscesses are caused by renal failure, diabetes, human immunodeficiency virus infection, or other forms of immunosuppression. Secondary abscesses are more frequently observed following trauma or instrumentation in the hip, lumbar spine, or inguinal area.[16] In this current study, the deceased had abdominal pain and breathing difficulty before the fatal event of death; however, no medical evaluation was done. There was no history of trauma or injury.

Psoas abscess is usually associated with a single organism, *S. aureus*, followed by *Streptococcus* and *E. coli*.[15] In this current case of psoas abscess, *E. coli* was demonstrated on blood culture and sample from the abscess. Monomorphic growth of bacteria in a clinical sample is indicative of true infection. However, microbiology believes in the reproducibility of organisms to be confirmed in post-mortem samples that it is extrapolated as the presence of the same bacteria in two samples collected at autopsy.[4]

These case reports provide a compelling insight into the severe complications that *E. coli* can cause SPG and psoas abscess, both of which are encountered in clinical practice and forensic pathology but rarely diagnosed on postmortem examination. The presented cases show the importance of considering atypical manifestations of common pathogens in critically ill patients, particularly those with prolonged hospitalization and sepsis.

### Limitations

The isolation of multiple organisms from the lungs cannot rule out the potential polymicrobial infection or contamination, limiting the reliability of post-mortem findings in identifying a definitive COD.

## CONCLUSIONS

Identification of severe, unusual illnesses such as psoas abscess and SPG associated with *E. coli,* depends heavily on PMM. To prevent contamination, timely and sterile sample collection is crucial. These studies offer vital information about pathogen-related complications, which helps determine COD, enhances diagnostic precision, and directs future therapeutic care. A regular autopsy that incorporates microbiological analysis improves medical knowledge and guides public health initiatives.

**Authors contributions:** MS: Conceptualization and drafting of manuscript; RKC: Manuscript review and references; AC: Sample and case data collection; AA: Manuscript review; RA: Conducted autopsy; AG: Sample processing and result interpretation.

**Ethical approval:** The Institutional Review Board approval is not required.

**Declaration of patient consent:** The authors certify that they have obtained all appropriate patient consent.

**Financial support and sponsorship:** Nil.

**Conflicts of interest:** There are no conflicts of interest.

**Use of artificial intelligence (AI)-assisted technology for manuscript preparation:** The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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**How to cite this article:** Sangita M, Chandela RK, Chandran A, Arora A, Gupta A, Anwar R. *Escherichia coli* in medicolegal autopsy causing symmetrical peripheral gangrene and psoas abscess. J Lab Physicians. 2025;17:126-9. doi: 10.25259/JLP_100_2024