Urinary Tract Infections during the COVID-19 Pandemic

Subjects: Infectious Diseases | Urology & Nephrology

Contributor: Tommaso Cai

The landscape of management of urinary tract infections (UTI) is changing rapidly. The COVID-19 pandemic draws the attention to the SARS-CoV-2 management with a subsequent reduced attention on bacterial infections. The COVID-19 diffusion containing procedures, such as use of facemasks and handwashing, have reduced spreading of bacteria and bacterial lung infections.

SARS-CoV-2 COVID-19 urinary tract infections antimicrobial stewardship antibiotic resistances

1. The Prevalence of Bacterial Co-Infections in COVID-19

It was demonstrated empiric use of antibiotics in a majority of patients with COVID-19 in a hospital setting [1][2]. The high use of antibiotics in COVID-19 patients is probably due to increased levels of blood inflammatory markers of bacterial infection, such as raised procalcitonin and C-reactive protein, in patients with COVID-19. However, most of these patients did not have a microbiologically proven bacterial co-infection [3]. According to 3834 hospitalized patients with COVID-19, the overall pooled proportion of patients who had laboratory-confirmed bacterial co-infections, was 7% [4]. Rawson et al. reported a similar finding of 8% prevalence of bacterial/fungal co-infection during hospital admission [5]. The same reported wide use of broad-spectrum antibiotics, despite paucity of evidence for bacterial co-infections and lack of antimicrobial stewardship considerations [5]. it was estimated that the prevalence of bacterial co-infection to be less than 10% in hospitalized patients with COVID-19.

2. The Prevalence of UTI Co-Infections in COVID-19

The prevalence of urinary tract co-infections in patients affected by COVID-19 has not been investigated explicitly. The majority of the reviewed reports focused on pneumological co-infections. However, the prevalence of urinary tract infections (UTI) co-infections in patients with COVID-19 can be extrapolated from others. Firstly, Bardi et al. reported the prevalence of UTI of 8% in 140 patients admitted to the intensive care unit, most of which were catheter-associated urinary tract infections [6]. Moreover, Karaba et al. reported a prevalence of 3% in 1016 patients admitted to five hospitals in the US [7]. It was concluded that in more than 60% of patients hospitalized with COVID-19 and urinary tract co-infections, the UTIs were probably over-diagnoses [8]. Hence, the true prevalence of UTI associated to COVID-19 seems to be very low.

3. Antibiotic Prescriptions and Antimicrobial Stewardship Considerations in COVID-19

For outpatients and hospitalized patients, the prevalence of bacterial co-infections in COVID-19 positive patients was 3.5% in outpatients and 14.3% in hospitalized patients, respectively [9]. Over-prescription of antibiotics in COVID-19 positive patients can increase selective pressure for development of antimicrobial resistance and collateral damage, such as *Clostridium difficile* infections [10]. As highlighted by Huttner et al., the over-prescribing of antibiotics may be due to lowered adherence to international guidelines on the use of antibiotics. It was emphasized that physicians involved in the management of COVID-19 positive patients have a high workload and show high levels of stress [11][12]. Furthermore, the higher rate of telemedicine within primary care, secondary care, and outpatient services also increased the number of antimicrobial prescriptions due to safety-netting and reduced access to laboratory diagnostics [10]. On the other hand, reduced access to pharmacies has limited the number of self-administered antibiotics, but rare antimicrobial stewardship initiatives within local healthcare environments have reduced the awareness of correct use of antibiotics during the pandemic [10][13]. The net effect of these COVID-19 related changes in clinical practice is an increased number of antibiotic prescriptions. Finally, as economic and health care resources were allocated to controlling the SARS-CoV-2 pandemic, the attention to antimicrobial resistance and antimicrobial stewardship diminished [13]. Huttner BD et al. now ask healthcare professionals to assess the impact of the COVID pandemic on antibiotic usage and resistance in all settings (community, nursing homes, and hospitals) [12]. However, the jury is still out in regards the impact of the COVID pandemic on antimicrobial stewardship programs and long-term rates of antimicrobial resistance [10].

4. The COVID-19 Pandemic: An Excellent Reminder of Antimicrobial Stewardship Principles

It might be said that the COVID-19 pandemic made us forget the need for antimicrobial stewardship in clinical practice, both in community as well as in the hospital setting. Although it still lack data about the long-term effects of COVID-19 on antimicrobial resistance, it is time to remind ourselves that antibiotic stewardship principles must be adhered to in order to avoid not only direct long-term effects of COVID-19, but also serious collateral damages on global health [12]. It was underlined that the importance of sticking to international guidelines in the management of urinary tract infections.

5. Think Twice before Prescribing Antimicrobials to COVID-19 Positive Patients!

As bacterial co-infections in COVID-19 patients are relatively rare (<10%) [6][7][8], prescription of antibiotics in COVID-19 patients should be avoided in patients without signs and/or symptoms related to bacterial infections [12]. Serum biomarkers, such as C-reactive protein and/or procalcitonin may play a role in the decision-making process before antibiotic prescription, but further investigations are required [8][12]. The white blood cells (WBC) count is generally considered as an index for bacterial infection, but its specificity in patients with SARS-CoV2 infection is

low due to its vulnerability to several factors, such as the presence of inflammatory status or asymptomatic bacteriuria that could increase the level of WBCs. On the other hand, procalcitonin seems to be a useful marker to discriminate between SARS-CoV2 and bacterial infection. Hann J et al. highlighted that a non-elevated procalcitonin level on admission to a healthcare center predicts the absence of bacterial co-infection. Procalcitonin might therefore facilitate implementation of antibiotic stewardship principles [14]. The ability of procalcitonin to discriminate between viral infection alone and viral infection with bacterial co-infection is due to the fact that viral infections are associated with high production of interferon-γ by macrophages, which inhibits TNF-α in the immune response [15].

6. Asymptomatic Bacteriuria Is Not a Risk Factor for Future Complications in COVID-19 Patients

Asymptomatic bacteriuria is generally over-treated in COVID-19 positive hospitalized patients [8]. This is due to the erroneous assumption that asymptomatic bacteriuria increases the risk of complications in COVID-19 positive patients, which often get indwelling urinary catheters during hospitalization with SARS-CoV-2 [8]. According to Geehan Suleymant al., the COVID-19 pandemic did not have a negative impact on CAUTI rates, even though the rate of indwelling urinary catheters increased [16]. Another aspect to take into account is that during the first wave of pandemic, the number of infectious disease episodes treated with antibiotics decreased, without evidence for an increase in complications [17]. This is an indirect demonstration of a general over-diagnosis and overtreatment of infectious diseases, resulting in overuse of antibiotics.

Delirium is not generally considered a “systemic sign of infection”, but it should be taken into account in elderly patients. Decision about antibiotic treatment is complex and challenging in patients with bacteriuria and delirium in connection with SARS-CoV-2 infection [18]. It was suggested to avoide treatment for these patients, as it has not been shown benefit from antibiotic treatment in elderly patients with asymptomatic bacteriuria and delirium [18]. Before the COVID-19 pandemic, Dasgupta reported a significant further functional loss in patients who received antibiotics, compared with those who did not [19].

7. Antimicrobial Prophylaxis before Urological Procedures and Surgery in COVID-19 Positive Patients

The COVID-19 pandemic deferred the majority of scheduled urological surgical interventions, especially in the first wave of the pandemic. Only urgent and emergency surgical interventions were performed. In the opinion of the present panel, patients with COVID-19 who are supposed to undergo surgical procedures should get standard antimicrobial prophylaxis in line with international guidelines, even though there are no clinical trials supporting this recommendation. Recently, Antonello Vs et al. demonstrated a significant decrease (49%) in surgical site infection during the COVID-19 pandemic in comparison with a pre-COVID period. It was highlighted the importance of increased use of personal protective equipment and products in the operating theater [20].

8. Urosepsis and COVID-19

A possible alteration induced by SARS-CoV-2 in blood coagulation was addressed by Jue Js et al. [21]. Other was demonstrated that significant changes in platelet gene expression and function in COVID-19 patients and highlighted the role of SARS-CoV-2 in platelet activation and aggregation, resulting in thrombosis and coagulopathy [22]. On the basis of these observations, Cai et al. reported an increased risk of pulmonary embolism in a small cohort of patients with urosepsis and speculated that the findings are due to enhanced stimulation of thrombo-inflammatory mechanisms by the bacterial infection in association with the increased platelet activation due to SARS-CoV-2 co-infection [23]. Even though further are required to confirm these considerations, a higher level of attention is required in patients with urosepsis and COVID-19 infections as regards the risk of thromboembolism

References

1. Wang, Z.; Yang, B.; Li, Q.; Wen, L.; Zhang, R. Clinical Features of 69 Cases with Coronavirus Disease 2019 in Wuhan, China. Clin. Infect. Dis. 2020, 71, 769–777.
2. Wu, C.; Chen, X.; Cai, Y.; Xia, J.; Zhou, X.; Xu, S.; Huang, H.; Zhang, L.; Zhou, X.; Du, C.; et al. Risk Factors Associated with Acute Respiratory Distress Syndrome and Death in Patients with Coronavirus Disease 2019 Pneumonia in Wuhan, China. JAMA Intern. Med. 2020, 180, 934–943.
3. Wan, S.; Xiang, Y.; Fang, W.; Zheng, Y.; Li, B.; Hu, Y.; Lang, C.; Huang, D.; Sun, Q.; Xiong, Y.; et al. Clinical features and treatment of COVID-19 patients in northeast Chongqing. J. Med. Virol. 2020, 92, 797–806.
4. Lansbury, L.; Lim, B.; Baskaran, V.; Lim, W.S. Co-infections in people with COVID-19: A systematic review and meta-analysis. J. Infect. 2020, 81, 266–275.
5. Rawson, T.M.; Moore, L.S.P.; Zhu, N.; Ranganathan, N.; Skolimowska, K.; Gilchrist, M.; Satta, G.; Cooke, G.; Holmes, A. Bacterial and Fungal Coinfection in Individuals with Coronavirus: A Rapid Review to Support COVID-19 Antimicrobial Prescribing. Clin. Infect. Dis. 2020, 71, 2459–2468.
6. Bardi, T.; Pintado, V.; Gomez-Rojo, M.; Escudero-Sanchez, R.; Azzam Lopez, A.; Diez-Remesal, Y.; Martinez Castro, N.; Ruiz-Garbajosa, P.; Pestaña, D. Nosocomial infections associated to COVID-19 in the intensive care unit: Clinical characteristics and outcome. Eur. J. Clin. Microbiol. Infect. Dis. 2021, 40, 495–502.
7. Karaba, S.M.; Jones, G.; Helsel, T.; Smith, L.L.; Avery, R.; Dzintars, K.; Salinas, A.B.; Keller, S.C.; Townsend, J.L.; Klein, E.; et al. Prevalence of Co-infection at the Time of Hospital Admission in COVID-19 Patients, A Multicenter Study. Open Forum Infect. Dis. 2020, 8, ofaa578.
8. Van Laethem, J.; Wuyts, S.C.M.; Pierreux, J.; Seyler, L.; Verschelden, G.; Depondt, T.; Meuwissen, A.; Lacor, P.; Piérard, D.; Allard, S.D. Presumed Urinary Tract Infection in Patients

Admitted with COVID-19: Are We Treating Too Much? Antibiotics 2021, 10, 1493.

9. Langford, B.J.; So, M.; Raybardhan, S.; Leung, V.; Westwood, D.; MacFadden, D.R. Bacterial co-infection and secondary infection in patients with COVID-19: A living rapid review and meta-analysis. Clin. Microbiol. Infect. 2020, 26, 1622–1629.
10. Rawson, T.M.; Moore, L.S.P.; Castro-Sanchez, E.; Charani, E.; Davies, F.; Satta, G. COVID-19 and the potential long-term impact on antimicrobial resistance. J. Antimicrob. Chemother. 2020, 75, 1681–1684.
11. Lai, J.; Ma, S.; Wang, Y.; Cai, Z.; Hu, J.; Wei, N. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. JAMA Netw. Open 2020, 3, e203976.
12. Huttner, B.D.; Catho, G.; Pano-Pardo, J.R.; Pulcini, C.; Schouten, J. COVID-19: Don’t neglect antimicrobial stewardship principles! Clin. Microbiol. Infect. 2020, 26, 808–810.
13. Borek, A.J.; Maitland, K.; McLeod, M.; Campbell, A.; Hayhoe, B.; Butler, C.C.; Morrell, L.; Roope, L.S.J.; Holmes, A.; Walker, A.S.; et al. Impact of the COVID-19 Pandemic on Community Antibiotic Prescribing and Stewardship: A Qualitative Interview Study with General Practitioners in England. Antibiotics 2021, 10, 1531.
14. Han, J.; Gatheral, T.; Williams, C. Procalcitonin for patient stratification and identification of bacterial co-infection in COVID-19. Clin. Med. 2020, 20, e47.
15. Müller, B.; Becker, K.L.; Schächinger, H.; Rickenbacher, P.R.; Huber, P.R.; Zimmerli, W.; Ritz, R. Calcitonin precursors are reliable markers of sepsis in a medical intensive care unit. Crit. Care Med. 2000, 28, 977–983.
16. Geehan Suleyman, M.D.; Rita Kassab, D.O.; Smitha Gudipati, M.D.; Ramesh Mayur, M.D.; Indira Brar, M.D. 779. COVID-19 Pandemic and Catheter-associated Urinary Tract Infection Trends. Open Forum Infect. Dis. 2021, 8, S486–S487.
17. van de Pol, A.C.; Boeijen, J.A.; Venekamp, R.P.; Platteel, T.; Damoiseaux, R.A.M.J.; Kortekaas, M.F.; van der Velden, A.W. Impact of the COVID-19 Pandemic on Antibiotic Prescribing for Common Infections in The Netherlands: A Primary Care-Based Observational Cohort Study. Antibiotics 2021, 10, 196.
18. Reyes, R.; Bono, G.; Finucane, T.E. So-called Urinary Tract Infection in the Era of COVID-19. J. Am. Geriatr. Soc. 2020, 68, 1927–1928.
19. Dasgupta, M.; Brymer, C.; Elsayed, S. Treatment of asymptomatic UTI in older delirious medical in-patients: A prospective cohort study. Arch. Gerontol. Geriatr. 2017, 72, 127–134.
20. Antonello, V.S.; Dallé, J.; Antonello, I.C.F.; Benzano, D.; Ramos, M.C. Surgical Site Infection after Cesarean Delivery in Times of COVID-19. Rev. Bras. Ginecol. Obstet. 2021, 43, 374–376.

21. Jue, S.; Alameddine, M. COVID-19 Coagulopathy: Considerations for Urologists. J. Urol. 2020, 204, 640–641.
22. Manne, B.K.; Denorme, F.; Middleton, E.A.; Portier, I.; Rowley, J.W.; Stubben, C.; Petrey, A.C.; Tolley, N.D.; Guo, L.; Cody, M.; et al. Platelet gene expression and function in COVID-19 patients. Blood 2020, 136, 1317–1329.
23. Cai, T.; Tandogdu, Z.; Wagenlehner, F.M.E.; Bjerklund Johansen, T.E. Re: COVID-19 Coagulopathy: Considerations for Urologists. J. Urol. 2020, 204, 848–849.