Kentucky Antimicrobial Stewardship Innovation Consortium

Educational Pearl

Anaerobe Awareness in Intra-Abdominal Infections

Empiric antibiotics for intra-abdominal infections should provide coverage of Enterobacterales (e.g. *E. coli*) and obligate anaerobic bacteria (e.g. *Bacteroides fragilis*). De-escalating empiric antibiotics to narrower-spectrum agents according to culture results is recommended.[1] However, anaerobic bacteria are difficult to grow in culture and may be absent in peritoneal or blood cultures.[2] Should anti-anaerobic antibiotics be continued in patients with positive cultures where no anaerobes are identified?

What is the risk in stopping anti-anaerobic antibiotics?

If empiric anti-anaerobic antibiotics are stopped early, there is concern for long-term treatment failure and abscess formation.

Animal models of intra-abdominal infections have demonstrated a biphasic course of infection consisting of a peritonitis phase and an abscess phase. Early acute peritonitis is driven by aerobic bacteria (e.g. *E. coli*) and associated with high mortality.[3,4] In animals that survive the peritonitis phase, an abscess phase develops that is associated with anaerobes, particularly *B. fragilis*. In one experiment, early mortality was reduced from 37% in untreated controls to 2% in animals treated with gentamicin monotherapy (e.g. gram-negative coverage without anaerobic coverage), however abscesses developed in 98% of surviving animals. Early mortality remained unchanged with clindamycin monotherapy (e.g. anaerobic coverage without gram-negative coverage), but abscesses were reduced from 100% in untreated controls to 5%. Mortality and abscess formation was 8% and 6%, respectively, in animals treated with combination gentamicin and clindamycin.[4]

What do guidelines recommend?

The 2024 Surgical Infection Society Intra-abdominal Infectious Guidelines suggest that anaerobic coverage be maintained with de-escalation. This is a weak recommendation based on low-quality evidence.[5]

What is the evidence?

Limited clinical evidence exists to inform on this practice. In one study, 100 patients with traumatic abdominal injury were randomized to antibiotics with anaerobic coverage (clindamycin + kanamycin) and without anaerobic coverage (cephalothin + kanamycin). Septic complications developed in 14 patients without anaerobic activity and in 5 patients with anaerobic activity.[6, 7]

Key Takeaway: Regardless of culture results, continuing anaerobic coverage in intra-abdominal infections for the full treatment duration is suggested in guidelines and may result in better long-term outcomes.

References:

1. Mazuski JE, Tessier JM, May AK, et al. The Surgical Infection Society Revised Guidelines on the Management of Intra-Abdominal Infection. *Surg Infect (Larchmt)*. 2017;18(1):1-76. doi:10.1089/sur.2016.261
2. Kaye KS. Antimicrobial de-escalation strategies in hospitalized patients with pneumonia, intra-abdominal infections, and bacteremia. *J Hosp Med*. 2012;7 Suppl 1:S13-S21. doi:10.1002/jhm.983
3. Goldstein EJ. Intra-abdominal anaerobic infections: bacteriology and therapeutic potential of newer antimicrobial carbapenem, fluoroquinolone, and desfluoroquinolone therapeutic agents. *Clin Infect Dis*. 2002;35(Suppl 1):S106-S111. doi:10.1086/341930
4. Bartlett JG, Onderdonk AB, Louie T, Kasper DL, Gorbach SL. A review. Lessons from an animal model of intra-abdominal sepsis. *Arch Surg*. 1978;113(7):853-857. doi:10.1001/archsurg.1978.01370190075013
5. Huston JM, Barie PS, Dellinger EP, et al. The Surgical Infection Society Guidelines on the Management of Intra-Abdominal Infection: 2024 Update. *Surg Infect (Larchmt)*. Published online July 11, 2024. doi:10.1089/sur.2024.137
6. Tally FP, Gorbach SL. Therapy of mixed anaerobic-aerobic infections. Lessons from studies of intra-abdominal sepsis. *Am J Med*. 1985;78(6A):145-153. doi:10.1016/0002-9343(85)90118-4
7. Thadepalli H, Gorbach SL, Broido PW, Norsen J, Nyhus L. Abdominal trauma, anaerobes, and antibiotics. *Surg Gynecol Obstet*. 1973;137(2):270-276.

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