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POLYMICROBIAL INTRAABDOMINAL INFECTION

Ronald Lee NICHOLS

Polimikrobiyal intraabdominal infeksiyon.

The emphasis concerning the treatment of surgical infections up to this time has been primarily on the development of new antibiotic agents whose spectra of activity effectively cover the offending organisms. However, in the patient with intraabdominal sepsis, the cardinal therapeutic modality is prompt and adequate surgical intervention. Parenterally administered antibiotics are also used to decrease the incidence of septicemia and/or to prevent the local invasion of normal tissue by the infectious invading bacteria(5,6). By necessity, the initial antibiotic regimen is chosen empirically on clinical grounds prior to microbiologic testing. It is for this reason that it is critical that every clinician be aware of the differences in the microflora of the various levels of the human gastrointestinal tract and their antibiotic susceptibilities.

The numbers and types of microorganisms increase progressively down the gastrointestinal tract. In the normal human, the stomach and proximal small intestine support a rather sparse bacterial flora, which includes both aerobes and anaerobes (less than 10^{10} per milliliter). Acidity and motility appear to be the major factors that inhibit the growth of bacteria within the stomach (10^2-10^3 per milliliter)(8). Diseases of the stomach and duodenum may compromise these factors. Thus, in cases of bleeding or obstructing duodenal ulcers, gastric ulcers, or carcinomas, the microflora of the stomach usually increase in number. When present, the gastric microflora is composed primarily of oral anaerobes, which are generally sensitive to penicillin, and the aerobic coliforms.

The microflora of the distal small bowel represents a transitional zone between the microflora of the upper and lower gastrointestinal tracts; modest numbers of aerobic and anaerobic microorganisms (10^3-10^8 per milliliter) are usually present. The largest concentrations of microorganisms are located in the colon, where up to 10^{11} anaerobes per gram of stool or milliliter of intestinal aspirate can be identified(7). Coliforms are present in the colon in concentrations of 10^8 per gram of stool. The solid intraabdominal organs, including the liver and spleen, rarely harbor a significant population of endogenous microflora.

This geographic arrangement of microorganisms within the gastrointestinal tract partly accounts for the differences in septic complications associated with injuries to the upper and lower intestine. Sepsis that occurs after upper intestinal leaks is generally less severe and presents less morbidity and mortality than sepsis that occurs after leaks following colonic injuries.

Altemeier, in 1938, was the first to stress the polymicrobic nature of the bacterial flora of peritonitis resulting from acute appendiceal perforation(1). In 1942, he also reported on the pathogenicity of bacteria isolated from patients with peritonitis(2). During the next three decades, little research was done to elaborate on these findings. In the last two decades, with the availability of modern techniques for the collection and processing of specimens for the study of anaerobic bacteria, their importance in clinical intraabdominal infections has become better understood.

The numbers of aerobic and anaerobic bacteria isolated from sites of intraabdominal sepsis depend on the nature of the microflora of the diseased or traumatized organ. A complex polymicrobial flora results when contamination from the gastrointestinal tract occurs. The polymicrobial nature of the pathogens in patients with intraabdominal infection is evident from several reports, which, when combined, showed that the average number of isolates of microorganisms from the infected sites ranged from 2 to 5(5,6). These figures include an average of 1 to 2 aerobes and 2 to 3 anaerobes per infection. One or more anaerobic species were isolated from 65 to 94 percent of the patients.

The commonly isolated aerobes in all of the studies included *Escherichia coli* and *Klebsiella, Streptococcus, Proteus* and *Enterobacter* species. The anaerobic species isolated most frequently were *Bacteroides, Peptostreptococcus* and *Clostridium* species. *Bacteroides fragilis* was the anaerobe most often isolated. Along with other species of *Bacteroides, Bacteroides fragi-*

Tulane University School of Medicine, 1430 Tulane Avenue, New Orleans, Louisiana 70112, USA.

lis accounted for up to 60 percent of all the anaerobic isolates in these studies. Purely anaerobic intraabdominal sepsis was reported in less than 15 percent of the cases, whereas purely aerobic infections were noted in only 10 percent. Therefore, both aerobes and anaerobes were involved in over 75 percent of the cases of intraabdominal infections.

The improvement and sophistication of care in the preoperative, intraoperative, and postoperative periods have increased immediate survival rates after severe abdominal injury. This increase, paradoxically, has accelerated the incidence of postoperative infections that may ultimately contribute to the complications and deaths associated with these injuries.

Perforated appendicitis and diverticulitis are among the most common diseases that precede intraabdominal sepsis, and studies show that these conditions were responsible for over 25 percent of 500 cases of intraabdominal abscess encountered over a 10-year period(3). Other predisposing causes of intraabdominal infections include abdominal trauma, perforation of the stomach or duodenum, spontaneous leak from a gastrointestinal carcinoma, pancreatitis, cholangitis, and intestinal infarction.

Intraabdominal sepsis after elective surgery occurs most often after colon resection and less frequently after elective gynecologic or upper gastrointestinal tract surgery.

Initially, peritonitis occurs after leakage of microorganisms from a diseased or traumatized organ (9). The dissemination of infection within the peritoneal cavity is dependent on five factors: 1) location and size of the primary leak; 2) nature of the underlying injury or disease; 3) the presence of adhesions from previous operations; 4) the duration of the present illness; and 5) efficiency of host defense mechanisms.

Generalized peritonitis is the most frequently reported type of intraabdominal infection; it usually follows either penetrating or blunt abdominal trauma and sometimes follows organ perforation if there is a failure to localize the infection.

Localization of the intraabdominal infection results in intraperitoneal, retroperitoneal or visceral abscess. Intraperitoneal abscesses appear most often in the right lower quadrant in association with appendicitis or perforated duodenal ulcer. They also appear in the left lower quadrant or in the pelvic, subphrenic and subhepatic spaces, but the abscesses are rarely found in the lesser sac or between the loops of intestine. Visceral abscesses are most commonly found in the liver, but are infrequently seen in the pancreas, spleen and kidney. More than 50 percent of liver abscesses are associated with either cholangitis or appendicitis.

Surgeons realize that thorough surgical drainage is the most important step in the proper treatment of intraabdominal sepsis. When possbible, drainage should be accomplished in a dependent fashion. The area of damaged or diseased viscera should be repaired or exteriorized thereby decrasing the chance of continued peritoneal contamination. Consideration of the use of a synthetic zipper should be entertained in patients with severe or recurrent intraabdominal infections in order to facilitate daily opening of the peritoneal cavity for purposes of irrigation, drainage and debridement(10). Unlike patients with superficial wound abscesses in whom drainage alone usually suffices, those with intraabdominal sepsis are best managed by a combination of surgical drainage and appropriate antibiotic therapy. The antibiotic agents chosen for treatment of intraabdominal sepsis should be given parenterally before, during, and after operative drainage to guarantee adequate tissue levels. The absolute duration of antibiotic treatment has not been determined, but usually is 5 to 10 days. This factor helps decrease further local invasion, secondary septicemia and metastatic abscess formation. The debate continues concerning which antibiotic agents should be used to obtain optimal clinical results.

In order to appropriately choose the empiric antibiotic agents one should primarily determine whether the intraabdominal infection was community or hospital acquired. In community acquired intraabdominal sepsis many single agents with both aerobic and anaerobic coverage have been recommended (Table) (11). In the patient with hospital acquired intraabdominal sepsis, special attention must also be paid to the possibility of an antibiotic resistant Gram negative bacillus in the mixed infection. It is for this reason that combination therapy (aminoglycoside or a monobactam and either clindamycin or metronidazole) or the single agent imipenem alone is frequently recommended. In all cases, continuance of the empiric antibiotics should be based on definitive culture and sensitivity results as well as clinical responses.

In addition to surgical treatment and parenteral antibiotics, other mechanical techniques have been utilized in patients with generalized intraabdominal infections following penetrating abdominal trauma with the purpose of reducing the bacterial burden within the intraabdominal cavity. These techniques include:

1. Irrigation of the peritoneal cavity(pour in water or water-pik)
   A. Saline
   B. Antibiotic solutions
   C. Iodophor solutions
2. Radical surgical debridement
3. Leaving the peritoneal cavity open
4. Reoperation
   A. Use of surgical zipper
   B. Classic techniques
5. Closed peritoneal catheter lavage

Studies to date have not strictly defined which of these techniques is preferable in the patient with severe intraabdominal infection.

The value of the use of immunomodulator drugs is also at this point unclear due to the lack of convincing well controlled clinical studies. Monoclonal antibodies against endotoxin have recently been shown to reduce overall mortality in some critically ill patients with Gram negative sepsis(4,13). However, more clinical studies are necessary in order for authoritative committees to indicate the patients who should be so treated. The use of these agents in sick patients is to be considered investigational at this point in time(12).

Table. Selected single and combination antibiotic agents that cover facultative/ anaerobic colonic microflora.

1. COMBINATION THERAPY
Aerobic Coverage - To be combined with a drug having anaerobic activity
Amikacin
Aztreonam
Ceftriaxone
Ciprofloxacin
Gentamicin
Tobramycin
Anaerobic Coverage - To be combined with a drug having facultative activity
Chloramphenicol
Clindamycin
Metronidazole
2. SINGLE DRUG THERAPY
Aerobic-Anaerobic Coverage - Single Agents
Ampicillin-sulbactam
Cefoxitin
Ceftizoxime
Imipenem-cilastatin
Piperacillin
Ticarcillin-clavulanic acid

KAYNAKLAR

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