TREATMENT SHORT-BOWEL SYNDROME

Treatment of short-bowel syndrome depends on the severity of symptoms and on whether the individual is able to maintain caloric and electrolyte balance with oral intake alone. Initial treatment includes judicious use of opiates (including codeine) to reduce stool output and to establish an effective diet. If the colon is in situ, the initial diet should be low in fat and high in carbohydrate in order to minimize diarrhea from fatty acid stimulation of colonic fluid secretion. MCTs (see Table 349-3), a low-lactose diet, and various soluble fiber–containing diets should also be tried. In the absence of an ileocecal valve, possible bacterial overgrowth must be considered and treated. If gastric acid hypersecretion is contributing to diarrhea and steatorrhea, a proton pump inhibitor may be helpful. Usually none of these therapeutic approaches provides an instant solution, but each can contribute to the reduction of disabling diarrhea.

The patient's vitamin and mineral status must also be monitored; replacement therapy should be initiated if indicated. Fat-soluble vitamins, folate, cobalamin, calcium, iron, magnesium, and zinc are the most critical factors to monitor on a regular basis. If these approaches are not successful, home PN is an established therapy that can be maintained for many years. Small-intestinal transplantation is becoming established as a possible approach for individuals with extensive intestinal resection who cannot be maintained without PN—i.e., those with intestinal failure. A recombinant analogue of glucagon-like peptide 2 (GLP-2; teduglutide) is approved for use in patients with PN-dependent short-bowel syndrome on the basis of its ability to increase intestinal growth and improve absorption.

BACTERIAL OVERGROWTH SYNDROMES

Bacterial overgrowth syndromes comprise a group of disorders with diarrhea, steatorrhea, and macrocytic anemia whose common feature is the proliferation of colonic-type bacteria within the small intestine. This bacterial proliferation is due to stasis caused by impaired peristalsis (*functional stasis*), changes in intestinal anatomy (*anatomic stasis*), or direct communication between the small and large intestine. These conditions have also been referred to as *stagnant bowel syndrome* or *blind loop syndrome.*

Pathogenesis The manifestations of bacterial overgrowth syndromes are a direct consequence of the presence of increased amounts of a colonic-type bacterial flora, such as *E. coli* or *Bacteroides*, in the small intestine. *Macrocytic anemia* is due to cobalamin—not folate—deficiency. Most bacteria require cobalamin for growth, and increasing concentrations of bacteria use up the relatively small amounts of dietary cobalamin. *Steatorrhea* is due to impaired micelle formation as a consequence of a reduced intraduodenal concentration of conjugated bile acids and the presence of unconjugated bile acids. Certain bacteria, including *Bacteroides*, deconjugate conjugated bile acids to unconjugated bile acids. Unconjugated bile acids are absorbed more rapidly than conjugated bile acids; as a result, the intraduodenal concentration of bile acids is reduced. In addition, the CMC of unconjugated bile acids is higher than that of conjugated bile acids, and the result is a decrease in micelle formation. *Diarrhea* is due, at least in part, to steatorrhea, when it is present. However, some patients manifest diarrhea *without* steatorrhea, and it is assumed that the colonic-type bacteria in these patients are producing one or more bacterial enterotoxins that are responsible for fluid secretion and diarrhea.

Etiology The etiology of these different disorders is bacterial proliferation in the small-intestinal lumen secondary to anatomic or functional stasis or to a communication between the relatively sterile small intestine and the colon, with its high levels of aerobic and anaerobic bacteria. Several examples of *anatomic* stasis have been identified: (1) one or more diverticula (both duodenal and jejunal) (Fig. 294-3*C*); (2) fistulas and strictures related to Crohn's disease (Fig. 349-3*D*); (3) a proximal duodenal afferent loop following subtotal gastrectomy and gastrojejunostomy; (4) a bypass of the intestine (e.g., a jejunoileal bypass for obesity); and (5) dilation at the site of a previous intestinal anastomosis. These anatomic derangements are often associated with the presence of a segment (or segments) of intestine out of continuity of propagated peristalsis, with consequent stasis and bacterial proliferation. Bacterial overgrowth syndromes can also occur in the *absence* of an anatomic blind loop when *functional* stasis is present. Impaired peristalsis and bacterial overgrowth in the absence of a blind loop occur in scleroderma, where motility abnormalities exist in both the esophagus and the small intestine (Chap. 382). Functional stasis and bacterial overgrowth can also develop in association with diabetes mellitus and in the small intestine when a direct connection exists between the small and large intestines, including an ileocolonic resection, or occasionally after an enterocolic anastomosis that permits entry of bacteria into the small intestine as a result of bypassing the ileocecal valve.

Diagnosis The diagnosis may be suspected from the combination of a low serum cobalamin level and an elevated serum folate level, as enteric bacteria frequently produce folate compounds that are absorbed in the duodenum. Ideally, the bacterial overgrowth syndromes are diagnosed by the demonstration of increased levels of aerobic and/or anaerobic colonic-type bacteria in a jejunal aspirate obtained by intubation. However, this specialized test is rarely available. Breath hydrogen testing with administration of lactulose (a nondigestible disaccharide) has also been used to detect bacterial overgrowth. The Schilling test can diagnose bacterial overgrowth (see Chap. 350e) but is not available routinely. Often the diagnosis is suspected clinically and confirmed by the response to treatment.

TREATMENT BACTERIAL OVERGROWTH SYNDROMES

Primary treatment should be directed, if at all possible, to the surgical correction of an anatomic blind loop. In the absence of functional stasis, it is important to define the anatomic relationships responsible for stasis and bacterial overgrowth. For example, bacterial overgrowth secondary to strictures, one or more diverticula, or a proximal afferent loop can potentially be cured by surgical correction of the anatomic state. In contrast, the functional stasis of scleroderma or certain anatomic stasis states (e.g., multiple jejunal diverticula) cannot be corrected surgically, and these conditions should be treated with broad-spectrum antibiotics. Tetracycline used to be the initial drug of choice; because of increasing resistance, however, other antibiotics, such as metronidazole, amoxicillin/clavulanic acid, rifaximin and cephalosporins, have been employed. The antibiotic should be given for ~3 weeks or until symptoms remit. Although the natural history of these conditions is chronic, antibiotics should not be given continuously. Symptoms usually remit within 2–3 weeks of initial antibiotic therapy. Treatment need not be repeated until symptoms recur. For frequent recurrences, several treatment strategies exist, but the use of antibiotics for 1 week per month, whether or not symptoms are present, is often most effective.

Unfortunately, therapy for bacterial overgrowth syndromes is largely empirical, with an absence of clinical trials on which to base rational decisions regarding antibiotic choice, treatment duration, and/or the best approach to therapy for recurrences. Bacterial overgrowth may also occur as a component of another chronic disease, such as Crohn's disease, radiation enteritis, or short-bowel syndrome. Treatment of the bacterial overgrowth in these settings will not cure the underlying problem but may be very important in ameliorating a subset of clinical problems that are related to bacterial overgrowth.

WHIPPLE'S DISEASE

Whipple's disease is a chronic multisystemic disease associated with diarrhea, steatorrhea, weight loss, arthralgia, and central nervous