promotion of ORT usually get precedence over preventive measures which are likely to benefit the community in the long term. Innovative strategies for educating the community about causes and methods of prevention of diarrhea need to be developed keeping in mind that many of the benefits and practices are part of the existing culture of **a** particular society and are difficult to change.

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Neutropenic Enterocolitis with Acute Leukemia

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Neutropenic enterocolitis (NE) also termed as typhlitis, nectrotizing enteropathy, ileocecal syndrome, is a fulminant necrotizing process involving segments of large and small intestine that occurs in the setting of agranulocytosis most commonly in patients with acute leukemia, lymphoma (induction or relapse), aplastic anemia, cyclic neutropenia and in immunosuppressed organ transplant recepients(l). It is a major cause for morbidity and mortality among patients with hematologic malignancies and autopsy studies have documented a 10-12% incidence in patients dying of leukemia(2,3). Most of the early reports have labelled this condition as **a** grave, preterminal event progressing to sepsis and death. However, the availability of modern antibiotics and supportive care

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with judicial surgical intervention has improved the prognosis when instituted early in the course of disease(4,6).

We report here a five-year-old leukemic child with neutropenic enterocolitis developing during induction where the clinical suspicion was confirmed on post mortem examination.

Case Report

A 5-year-old male child presented with fever, pallor and generalized lymphadenopathy of 8 days duration. His hematological findings revealed Hb 2.8 g/dl, total WBC 1,900/cu mm, 26% polymorphonuclear cells, 74% lymphocytes and decreased platelet numbers on smear. He was diagnosed to have acute lymphoblastic leukemia-L_1 morphology, with 65% PAS positive blasts on the bone marrow aspirate smears. His chest X-ray and biochemical profile was normal. Chemotherapy as per protocol POG-8602 was started with Vincristine, L-Asparaginase, prednisolone and intrathecal chemoprophylaxis. Seven days after beginning of induction, he had an abscess over the right hand dorsum following thrombophlebitis at the venepuncutre site.

On 20th day, he complained of abdominal pain with mild fever which subsided hence he was not hospitalized. Four days later he returned with moderate fever, persistent abdominal pain and diarrhea. On examination, the temperature ranged between 100-104°F, and there was severe stomatitis with oral mucosal uncerations and bleeding. Abdominal examination revealed generalized tenderness and tender hepatomegaly. Plain X-ray of the abdomen appeared normal. Blood count revealed a low absolute neutrophil count of 460, with reduced platelets on smear. Blood culture showed no growth and stool culture grew *E.Coli* and *Klebsiella.* Serum amylase was normal, SGOT - 65 IU/ml and SGPT - 44 lU/ml. Bone marrow examination showed remission pattern. PT and PTT were normal. With this clinical picture of a bacterial infection, treatment was started with cefotaxime, tobramycin and metrogyl along with supportive packed cell transfusions and platelet concentrates. Failure of improvement led to the suspicion of neutropenic enterocolitis though confirmation of this diagnosis by investigative methods like real time sonography could not be done. The child remained persistently febrile and continued to have a bloody diarrhea. A repeat blood culture was negative. On the thirty first post-induction day antibiotics were changed (ceftazidime and amikacin) and bowel rest instituted. However, the patient succumbed on the 34th post-induction day. A post mortem performed showed remarkable abdominal findings supporting the clinical suspicion of neutropenic enterocolitis. Esophagus and stomach were normal but small intestine and colon were edematous with patchy areas of gangrene and hemorrhage. Histopathological examination of these areas revealed transmural necrosis, crypt abscesses and fibrin thrombi. Bacterial colonization was seen. There was no evidence of fungal colonisation or leukemic infiltrates. Liver was normal on cut section.

Discussion

Neutropenic enterocolitis (NE), a fulminant necrotizing process is a well recognised complication of neutropenia in patients dying from hematologic malignancies especially acture leukemia as indicated by various autopsy series(2,3). Moir and Bale reviewed 50 necropsies of leukemic children and found that necrosis of the colon was the primary cause of death in 38%, cecal involvement in 12% of cases. Other investigators have found similar results and it appears that many of

these cases are not clearly mainfested clinically and the diagnosis is made only at autopsy. NE is a diagnosis of exclusion in neutropenic patients with abdominal pain when cases with localized pain and those with a surgical cause for generalized pain are excluded(5,7).

NE includes a spectrum of involvement of the gastro-intestinal tract varying from small bowel and colonic mucosal edema to transmural inflammation and infraction. Pathogenesis is obscure but appears to be due to bacterial invasion following prolonged neutropenia and cytotoxic agent induced mucosal epithelial damage(4,5). The drug cytarabine has been implicated to produce necrosis of mucosal epithelium(4). Initial symptoms mainly nausea, vomiting and abdominal pain with diarrhea may be vague, recurrent and nonspecific, hence indistinguishable from acute appendicitis, vincristine or L-Asparaginase toxicity and pseudomembranous colitis. Full blown complex consists of severe abdominal pain, fever, diarrhea - occasionally with malena, with sepsis following within hours to days. Abdominal tenderness often more in the right lower quadrant is seen, again not specific for the diagnosis of NE. In some series half $f the patients had abnormal liver function tests(5). Plain abdominal radiographs showed a variable absence of gas shadows or ileus in approximately 50 % of the cases reviewed by Stames *et al.* and only in the preterminal stages which is too late for any successful management. Barium enema and colonoscopy are hazardous procedures. Real time sonography has recently been established as a safe, rapid and reliable method of diagnosing NE(1). The 'doughnut' like appearance of the small bowel indicating mucosal edema directly reflects the pathology demostrated at laparotomy. Recovery from NE hinges on early institution of aggressive medical treatment to support the patient until the return of circulating neutrophils and more cases are now successfully managed medically. In the 77 children with acute myeloid leukemia on intensive chemotherapy reviewed by Shamberger *et al*.(4), 25 had episodes of NE. Of these 25 patients 20 were managed successfully without surgical intervention. In the series review by Starnes *et al.{5)* of the 58 patients with malignancies presenting with abdominal pain during episodes of neutropenia, 18 were diagnosed as neutropenic enterocolitis and 11 (60%) recovered with conservative therapy. The patients who died were those who failed to recover normal granulocyte levels.

In conclusion, we believe that neutropenic enterocolitis is relatively common entity but is often missed antemortem. In order to detect it early, an ultrasound examination of all neutropenic patients with abdominal pain and/ or diarrhea should be undertaken. If bowel wall thickening is detected, appropriate broad spectrum antibacterial therapy and bowel rest should be instituted.

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