RESEARCH LETTERS

Peritoneal Tuberculosis After Imatinib Therapy

Imatinib mesylate, a selective inhibitor of the *BCR-ABL* tyrosine kinase gene, is now a standard therapy in patients with chronic myeloid leukemia (CML) and gastrointestinal stromal tumor (GIST). Recent studies have shown that imatinib alters T-cell–mediated immune responses,[1-4] raising the possibility of opportunistic infections associated with imatinib therapy. So far, few epidemiological data are available to support this hypothesis. We report herein a case of peritoneal tuberculosis (TB) following 4 months of imatinib therapy for CML.

Report of a Case. A 37-year-old Swiss-born man was diagnosed as having *BCR-ABL*–positive CML, and imatinib mesylate therapy was initiated (400 mg/d). One month later, the imatinib dosage was reduced owing to an elevation in transaminase (3 times the upper limit of normal) and alkaline phosphatase (4 times the upper limit of normal) levels. Serologic test results for human immunodeficiency virus and hepatitis A, B, and C virus were negative, and the abnormal liver test results were attributed to imatinib therapy. Four months later, the imatinib mesylate dosage was again increased to 400 mg/d. One week later, the patient developed abdominal pain, anorexia, and nausea. Abdominal computed tomography revealed ascites, hepatosplenomegaly, and diffuse infiltration of mesenteric fat. An analysis of ascitic fluid revealed a white blood cell count of 1100/μL (50% lymphocytes) (to convert to $\times 10^9$/L, multiply by 0.001). Standard bacterial cultures remained sterile. Findings from a Ziehl-Neelsen stain and mycobacterial culture were negative for organisms. Imatinib therapy was discontinued. Exploratory laparoscopy revealed extensive peritonitis, and peritoneal biopsy specimens demonstrated granulomatous inflammation, with a negative Ziehl-Neelsen stain result but a positive polymerase chain reaction result for *Mycobacterium tuberculosis* complex and positive cultures for *M tuberculosis*. The patient had no history of travel to a TB endemic country, prior TB exposure, homelessness, or substance use. A chest radiograph show no abnormalities. The initiation of antituberculous therapy was followed by clinical improvement. Imatinib therapy was not restarted because of a concern for pharmacological interaction with rifampin. After 6 months of antituberculous therapy, the patient underwent a hemopoietic stem cell transplantation without further infectious complications.

At the time of TB diagnosis, 1 month after imatinib therapy discontinuation, there was global lymphopenia ($CD3^+$, $CD4^+$, and $CD8^+$ cells: 190 [76% {percentage of total lymphocytes}], 155 [62%], and 39 [16%] cells/μL, respectively) and no evidence of blast transformation of CML. After 2 months of antituberculous therapy, lymphopenia was still present but less pronounced ($CD3^+$, $CD4^+$, and $CD8^+$ cells: 846 [92%], 619 [67%], and 222 [24%] cells/μL, respectively).

Comment. To our knowledge, this is the second report of TB reactivation in association with imatinib therapy. The incidence of TB in Switzerland is low (<10 per 100 000 population per year), and the patient had no history of TB exposure. Global lymphopenia might have facilitated TB reactivation, but TB itself may induce transient lymphopenia.[5] In fact, lymphocyte counts rose to subnormal levels after the initiation of antituberculous therapy. The increased incidence of herpes zoster[6] and previous cases of pulmonary nocardiosis,[7] pulmonary TB,[8] and fungal pneumonia[9] raise the possibility of opportunistic infections associated with imatinib therapy, but more data are needed. It might be prudent to investigate the presence of latent TB (by purified protein derivative skin testing or interferon-γ release assay) before the initiation of imatinib therapy.

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1. Cwynarski K, Laylor R, Macchiarulo E, et al. Imatinib inhibits the activation and proliferation of normal T lymphocytes in vitro. *Leukemia.* 2004;18(8):1332-1339.
2. Dietz AB, Souan L, Knutson GJ, Bulur PA, Litzow MR, Vuk-Pavlovic S. Imatinib mesylate inhibits T-cell proliferation in vitro and delayed-type hypersensitivity in vivo. *Blood.* 2004;104(4):1094-1099.
3. Gao H, Lee BN, Talpaz M, et al. Imatinib mesylate suppresses cytokine synthesis by activated CD4 T cells of patients with chronic myelogenous leukemia. *Leukemia.* 2005;19(11):1905-1911.
4. Sinai P, Berg RE, Haynie JM, Egorin MJ, Ilaria RL Jr, Forman J. Imatinib mesylate inhibits antigen-specific memory CD8 T cell responses in vivo. *J Immunol.* 2007;178(4):2028-2037.

5. Jones BE, Oo MM, Taikwel EK, et al. CD4 cell counts in human immunodeficiency virus-negative patients with tuberculosis. *Clin Infect Dis*. 1997;24(5):988-991.
6. Mattiuzzi GN, Cortes JE, Talpaz M, et al. Development of Varicella-Zoster virus infection in patients with chronic myelogenous leukemia treated with imatinib mesylate. *Clin Cancer Res*. 2003;9(3):976-980.
7. Lin JT, Lee MY, Hsiao LT, et al. Pulmonary nocardiosis in a patient with CML relapse undergoing imatinib therapy after bone marrow transplantation. *Ann Hematol*. 2004;83(7):444-446.
8. Takashima M, Igaki N, Matsuda T, et al. Malignant gastrointestinal stromal tumor of the small intestine complicated with pulmonary tuberculosis during treatment with imatinib mesylate. *Intern Med*. 2005;44(2):114-119.
9. Speletas M, Vyzantiadis TA, Kalala F, et al. Pneumonia caused by *Candida krusei* and *Candida glabrata* in a patient with chronic myeloid leukemia receiving imatinib mesylate treatment. *Med Mycol*. 2008;46(3):259-263.

Underdiagnosis of Obesity in Adults in US Outpatient Settings

Obesity affects nearly 32%—more than 60 million—American adults.[1] The obesity epidemic imposes an enormous cost on the nation's health[2] and economy.[3] Evidence-based clinical guidelines recommend that treatment for obesity incorporates a 2-step process: assessment and management.[4] Routine screening and accurate diagnosis are among the first steps leading to proper treatment. However, research on obesity screening and diagnosis in US outpatient settings is limited.

Methods. We examined the rates of obesity screening and diagnosis in a nationally representative sample of visits by patients 18 years and older to private physician offices and hospital outpatient departments across the United States. Data were obtained from the 2005 National Ambulatory Medical Care Surveys conducted by the National Center for Health Statistics (NCHS) (http://www.cdc.gov/nchs/about/major/ahcd/ahcd1.htm [accessed July 23, 2008]). Patient, physician, and clinical information is collected at each randomly selected visit and is recorded on NCHS standard patient record forms. Measurements of height and weight were captured for the first time in 2005. Body mass index (BMI) (calculated as weight in kilograms divided by height in meters squared) and obesity were defined according to accepted standards.[4] Physician diagnoses were documented using open-ended responses for (up to 3) visit diagnoses, which were later coded by NCHS staff according to the *International Classification of Diseases, Ninth Revision, Clinical Modification* and check boxes for a prespecified list of current medical problems, one of which was obesity, regardless of visit diagnoses. The unit of analysis was the patient visit. National estimates were generated using the SURVEYMEANS procedure (version 9.1.3; SAS Institute, Cary, North Carolina) for the number and proportion of patient visits, including 95% confidence intervals (CIs), by taking into account the sampling weights and multistage-stratified probability sampling designs of the surveys.

Results. In 2005, American adults 18 years and older made an estimated total of 845 million outpatient visits (95% CI, 757 million–932 million). Measurements were recorded during 42% (95% CI, 39%-46%) of total visits for height, 65% (95% CI, 62%-68%) for weight, and 41% (95% CI, 37%-45%) for both height and weight. Of the visits for preventive care only, the corresponding rates were 52% (95% CI, 46%-58%), 75% (95% CI, 71%-80%), and 51% (95% CI, 46%-57%), respectively. Of the total visits in which BMI was obtainable, 37% (95% CI, 35%-40%) were for patients with a BMI of 30.0 or greater.

Only 29% (95% CI, 25%-32%) of visits by patients who were obese according to their BMI had a documented diagnosis of obesity (**Figure**). The proportion of visits during which obesity was diagnosed was 19% (95% CI, 15%-22%) for patients whose BMI was between 30.0 and 34.9, 32% (95% CI, 26%-38%) for those whose BMI was between 35.0 and 39.9, and 50% (95% CI, 43%-57%) for those whose BMI was 40.0 or greater. Obesity was diagnosed in less than 2% of visits by patients whose BMI was less than 30.0. Owing to the underreporting of clinical obesity, the agreement between obesity defined by BMI and that by physician diagnosis was low ($\kappa = 0.3$).

Comment. These results indicate that obesity is underappreciated in clinical practice throughout the United States. Health care providers often fail to obtain needed biophysical patient data and do not clinically identify obesity even when data that are obtained suggest this condition. Barriers to obesity screening and diagnosis are likely multiple and may involve system, health care provider, and patient factors, including but not limited to, the lack of infrastructure to meet the needs of obese patients, lack of time for preventive care, lack of health care provider skills or financial incentives to address obesity, health care provider or patient concerns about weight stigma, and antifat bias by health care providers.[5,6] Obesity is a complex chronic condition, and health care providers have an important role in preventing, identifying, and managing obesity.[4] Body mass index and waist circumference are simple, validated measures of body fat that provide a reliable prediction of disease risk. Research aimed at determining the barriers to optimal health care for obese patients will guide the development of in-

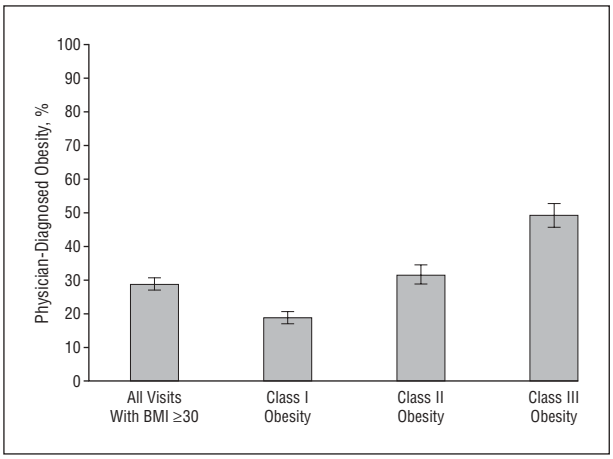

Figure. Association of physician-diagnosed obesity with clinically measured body mass index (BMI) (calculated as weight in kilograms divided by height in meters squared). Error bars indicate 95% confidence intervals.