RESEARCH LETTER

Infliximab With Low-Dose Methotrexate for Prevention of Postsurgical Recurrence of Ileocolonic Crohn Disease

Postoperative recurrence of Crohn disease is a very frequent event, and none of the drugs used for the purpose has really shown a clear-cut efficacy. Infliximab, a monoclonal antibody anti–tumor necrosis factor α (anti–TNF-α), is very effective in the treatment of active Crohn disease, but its benefit in preventing postoperative recurrence is still unknown. Yet, its impact, both medical and economic, could be major. Local injection of infliximab for early mucosal postoperative recurrence of Crohn disease seems feasible and safe; however, preliminary results have been disappointing. By contrast, a patient treated with intravenous infliximab immediately after surgery to prevent the recurrence of colonic Crohn disease has been disease free for 48 months after surgery.

Methods. In the present prospective pilot study, infliximab was administered 2 weeks after surgery, along with low-dose methotrexate, whereas controls were treated with mesalamine alone. There is no evidence for a role of methotrexate in preventing recurrence; however, we elected to use this drug because it is known to reduce long-term immunogenicity of infliximab. This is not a randomized study: the decision to include a patient in one group or the other, given the experimental nature of the infliximab-based preventive strategy, was solely based on the full understanding and approval (with written informed consent) of each patient. Before surgery, patients to be treated with infliximab were screened (purified protein derivative skin test, chest radiography, and careful history taking) and were found negative for latent tuberculosis. They were also evaluated (and found negative) for past and present cardiac, neurologic, lymphoproliferative, and other neoplastic diseases. After surgery, patients were subjected to endoscopy at 12 and 24 months; small-bowel enteroclysis or magnetic resonance imaging at 12 and 24 months; and physical examination with interviews, together with an extensive battery of blood tests (complete blood cell count; erythrocyte sedimentation rate; C-reactive protein, albumin, electrolyte, autoantibody, and thyroid hormone levels; and liver and renal function tests) every 3 months. Infliximab was given as a slow intravenous infusion at the dosage of 5 mg/1 kg of body weight starting from 2 weeks after surgery, followed by standard maintenance treatment (2, 6, and then every 8 weeks) and therapy with low-dose methotrexate (10 mg/wk by mouth).

Patients in the control group were also subjected to endoscopy and small-bowel enteroclysis or magnetic resonance imaging once a year and physical examinations with interviews and blood tests every 3 months. Controls were given mesalamine-coated tablets, 800 mg 3 times daily, starting from 2 weeks after surgery.

In both groups, the use of all medications was discontinued at least a month before surgery. No other medications were allowed except for occasional tablets of paracetamol or nonsteroidal anti-inflammatory drugs. Recurrence was defined as any evidence of disease at 2 years according to simplified endoscopic or clinical criteria. In particular, clinical relapse was defined as a score of 2 or greater on the clinical recurrence grading scale (where 1 indicates absent; 2, mild; 3, moderate; and 4, severe symptoms) recently proposed by Hanauer et al, while endoscopic relapse was defined as a score of 2 or greater on the scale of Rutgeerts et al. The study protocol was approved by the institution ethics committee.

The Table illustrates the patients included in the study and their clinical features. Seven patients in total (3 women and 4 men) were treated postoperatively with infliximab and low-dose methotrexate. Ages ranged from 23 to 64 years (median, 36 years). Of these patients, 4 had an ileocecal resection, 1 a segmental ileal resection (he had been previously subjected to ileocecal resection), and 2 a segmental sigmoid resection (1 of these patients previously underwent ileocecal resection). Indications for resection included disease activity (2 patients) and structure (5 patients). The disease had been present for a minimum of 3 to a maximum of 14 years (median, 7 years). Two patients currently smoke, while 1 is taking oral contraceptives.

The clinical features of the control group are also illustrated in the Table. Sixteen patients (5 women and 11 men) in total were operated on and treated postoperatively with mesalamine. Ages ranged from 23 to 70 years (median, 40.5 years). Nine patients underwent ileocecal resection (1 of whom had previously undergone segmental sigmoid resection); 1, proctocolectomy; 2, right hemicolectomy plus ileal resection; 1, left hemicolectomy; 1, cecal resection; 1, ileal resection; and 1, segmental sigmoid resection. The reason for surgery was a stricture in 8 patients, disease activity in 7, and combined stricture and disease activity in 1. The disease had been present for a minimum of 1 to a maximum of 23 years (median, 5.5 years). Four patients currently smoke, while none was taking oral contraceptives.

In all cases, surgery was considered radical (ie, it completely removed the involved intestine). Preoperative assessment (endoscopy and radiology) had excluded dis-
ease outside the operated location. Of the 23 patients, none had operative or postoperative complications and none was lost to follow-up.

Results. The results, summarized in the last column of the Table, show that in the group treated postoperatively with infliximab and low-dose methotrexate, none has had, after 2 years, endoscopic or clinical recurrence as defined in the "Methods" section. No abnormalities were detected in blood test results during the study period and at the 2-year follow-up examination. We did not record any potential adverse effect that could be attributed to these medica-

### Table. Clinical Features of Patients With Crohn Disease and Treatment Results

<table>
<thead>
<tr>
<th>Patient No./ Sex/Age, y</th>
<th>Disease Duration, y</th>
<th>Involved Intestine</th>
<th>Type of Surgery</th>
<th>Reason for Surgery</th>
<th>Current Smoking Status</th>
<th>Oral Contraceptives After Surgery</th>
<th>Medication Before Surgery</th>
<th>Recurrence After Surgery at 2 y (Type of Recurrence)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/M/64</td>
<td>7</td>
<td>Ileocecal</td>
<td>Ileocecal resection</td>
<td>Stricture</td>
<td>No</td>
<td>No</td>
<td>Mesalamine, prednisone cycles</td>
<td>No</td>
</tr>
<tr>
<td>2/M/36</td>
<td>3</td>
<td>Ileocecal</td>
<td>Ileocecal resection</td>
<td>Stricture</td>
<td>No</td>
<td>No</td>
<td>Mesalamine, prednisone cycles</td>
<td>No</td>
</tr>
<tr>
<td>3/F/24</td>
<td>3</td>
<td>Sigmoid colon</td>
<td>Sigmoid resection</td>
<td>Disease activity</td>
<td>No</td>
<td>No</td>
<td>Mesalamine, prednisone cycles</td>
<td>No</td>
</tr>
<tr>
<td>4/F/23</td>
<td>9</td>
<td>Sigmoid colon</td>
<td>Sigmoid resection</td>
<td>Disease activity</td>
<td>Yes</td>
<td>Yes, 5-6/d</td>
<td>Mesalamine, prednisone cycles, azathioprine</td>
<td>No</td>
</tr>
<tr>
<td>5/M/61 6/F/40</td>
<td>14</td>
<td>Ileum</td>
<td>Ileal resection</td>
<td>Stricture</td>
<td>Yes</td>
<td>Yes, 20/d</td>
<td>Mesalamine, prednisone cycles</td>
<td>No</td>
</tr>
<tr>
<td>7/M/32 Mesalamine group</td>
<td>4</td>
<td>Ileocecal</td>
<td>Ileocecal resection</td>
<td>Stricture</td>
<td>No</td>
<td>No</td>
<td>Mesalamine</td>
<td>No</td>
</tr>
<tr>
<td>1/M/47</td>
<td>2</td>
<td>Ileocecal</td>
<td>Ileocecal resection</td>
<td>Stricture</td>
<td>No</td>
<td>No</td>
<td>Mesalamine, prednisone cycles</td>
<td>Yes (endoscopic and clinical)</td>
</tr>
<tr>
<td>2/F/29</td>
<td>1</td>
<td>Ileocecal</td>
<td>Ileocecal resection</td>
<td>Disease activity</td>
<td>No</td>
<td>No</td>
<td>Mesalamine, prednisone cycles</td>
<td>Yes (endoscopic)</td>
</tr>
<tr>
<td>3/F/42</td>
<td>19</td>
<td>Pancolitis</td>
<td>Proctocolectomy</td>
<td>Disease activity</td>
<td>No</td>
<td>In the past</td>
<td>Mesalamine, prednisone cycles, tacrolimus</td>
<td>Yes (endoscopic plus fistula)</td>
</tr>
<tr>
<td>4/M/49</td>
<td>23</td>
<td>Ileocecal</td>
<td>Ileocecal resection</td>
<td>Stricture</td>
<td>Yes</td>
<td>No</td>
<td>Mesalamine</td>
<td>Yes (endoscopic)</td>
</tr>
<tr>
<td>5/M/41</td>
<td>6</td>
<td>Ileocecal</td>
<td>Ileocecal resection</td>
<td>Stricture</td>
<td>No</td>
<td>No</td>
<td>Mesalamine, prednisone cycles</td>
<td>Yes (endoscopic)</td>
</tr>
<tr>
<td>6/F/23</td>
<td>8</td>
<td>Ileococcal</td>
<td>Ileocecal resection</td>
<td>Stricture</td>
<td>No</td>
<td>Yes, 5-6/d</td>
<td>Mesalamine, prednisone cycles</td>
<td>Yes (endoscopic)</td>
</tr>
<tr>
<td>7/F/42</td>
<td>5</td>
<td>Ileum and right col</td>
<td>Right hemicolectomy</td>
<td>Disease activity</td>
<td>No</td>
<td>Yes, 20/d</td>
<td>Mesalamine, prednisone cycles</td>
<td>Yes (endoscopic)</td>
</tr>
<tr>
<td>8/M/47</td>
<td>3</td>
<td>Cecum</td>
<td>Cecal resection</td>
<td>Stricture</td>
<td>No</td>
<td>No</td>
<td>Mesalamine, prednisone cycles</td>
<td>No</td>
</tr>
<tr>
<td>9/M/34</td>
<td>1</td>
<td>Ileum</td>
<td>Ileal resection</td>
<td>Disease activity</td>
<td>No</td>
<td>No</td>
<td>Mesalamine, prednisone cycles</td>
<td>No</td>
</tr>
<tr>
<td>10/F/38</td>
<td>7</td>
<td>Left colon</td>
<td>Left hemicolectomy</td>
<td>Disease activity</td>
<td>No</td>
<td>In the past</td>
<td>Mesalamine</td>
<td>No</td>
</tr>
<tr>
<td>11/M/40</td>
<td>1</td>
<td>Ileocecal</td>
<td>Ileocecal resection</td>
<td>Disease activity</td>
<td>No</td>
<td>In the past</td>
<td>No</td>
<td>No</td>
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<tr>
<td>12/M/39</td>
<td>10</td>
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<td>Ileocecal resection</td>
<td>Stricture</td>
<td>No</td>
<td>No</td>
<td>Mesalamine, prednisone cycles</td>
<td>Yes (endoscopic)</td>
</tr>
<tr>
<td>13/M/61 14/M/33</td>
<td>15 1</td>
<td>Ileocecal</td>
<td>Ileocecal resection</td>
<td>Stricture</td>
<td>No</td>
<td>In the past</td>
<td>Mesalamine</td>
<td>Yes (endoscopic)</td>
</tr>
<tr>
<td>15/M/70 16/M/39</td>
<td>6 1</td>
<td>Sigmoid colon</td>
<td>Sigmoid resection</td>
<td>Disease activity</td>
<td>No</td>
<td>Yes, 5-6/d</td>
<td>Mesalamine, prednisone cycles</td>
<td>Yes (endoscopic and clinical)</td>
</tr>
</tbody>
</table>

Abbreviation: NA, not applicable.

a The use of every medication was stopped at least 4 weeks before surgery.

b Infliximab, 5 mg/kg of body weight, was given with methotrexate, 10 mg/wk by mouth.

c The mesalamine dosage was 2.4 g/d.
tions. However, 2 patients showed transient and border-
line positivity for lupus anticoagulant but none of the typi-
cal features of frank systemic lupus erythematosus, a very
rare complication of infliximab treatment.9 All the pa-
tients in this group reported an excellent quality of life and
still receive maintenance treatment.

The group treated with mesalamine also tolerated the
drug well, and no adverse effects were recorded during
the study period. However, in contrast to the group treated
with infliximab and low-dose methotrexate, only 4 of the
16 patients (25%) were disease free 2 years after sur-
gery. In particular, of the 12 patients with recurrent dis-
ease, 7 had endoscopic relapse, while 5 fulfilled both
the endoscopic and the clinical criteria of recurrence. Of the
latter patients, 1 developed a perianal fistula. Of the 12
patients with endoscopic recurrence, 9 had a score of 3
or greater on the clinical recurrence grading scale. Of the
5 patients with a clinical (as well as endoscopic) recur-
rence, 4 had a score of 3 or greater. Most patients with
any type of recurrence had elevation of the inflamma-
tory indexes and/or a modest to moderate decrease in he-
moglobin level. These data are consistent with well-
known recurrence rates recently published in the literat-
ure7–10 and further indicate that mesalamine is not
an effective therapy to prevent recurrence.11

The Figure shows the endoscopic appearance of the mucosal anastomosis in 2 patients 2 years after ileocecal resection and maintenance treatment with intravenous infliximab with low-dose methotrexate (A) or mesala-
mine (B).

Comment. Although we are well aware of the many limi-
tations of our study (eg, lack of randomization, small sample size, and single-center experience), in our series of patients, infliximab with low-dose methotrexate was

extremely effective in preventing postsurgical recur-
rence of Crohn disease. Although we cannot exclude an a priori an effect of methotrexate in preventing recur-
rence, the lack of previous evidence1 and the very small
dose used in this study argue against it.

The results of this study reinforce the hypothesis that
infliximab may actually be capable, if given early, to
change the natural history of Crohn disease. We believe
that a multicenter, randomized, controlled study to firmly
establish the impact of this medication on the inevita-
bility of disease recurrence12 is warranted.

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Terrosu, Avellini, and Maiero. Analysis and interpreta-
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Drafting of the manuscript: Sorrentino. Critical revision of
the manuscript for important intellectual content: Sorrentino,
Terrosu, and Avellini. Administrative, technical, and ma-
terial support: Maiero. Study supervision: Sorrentino,
Terrosu, and Avellini.

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sored by the pharmaceutical industry.

1. Sandborn WJ, Feagan BG. The efficacy of azathioprine and 6-mercaptopu-
rine for the prevention of postoperative recurrence in patients with Crohn’s
Chronic Venous Disease and Injection Drug Use

We commend Armstrong for documenting the increasing age of injection drug users and relating this to the epidemiology of blood-borne pathogens. We wish to highlight other chronic complications occurring in injection drug users that have been infrequently reported. We have studied one of these conditions, chronic venous disease (CVD), extensively. Chronic venous disease causes lower extremity edema, aching discomfort, skin changes, and refractory and recurrent leg ulcers, resulting in a lifelong, progressively debilitating condition. The development of CVD is influenced by the condition of the veins and/or valves, ankle range of motion as part of the calf muscle pump, and the microcirculation. The damage to the veins from injection drug use (IDU) continues to evolve even after IDU has stopped. In our work on injection drug users receiving methadone maintenance treatment, we found an 87% point prevalence of CVD, with 52% of affected persons having the most advanced stages of disease. Most damage appears to occur in persons who have injected in the groin, legs, and feet. In injection drug users, CVD occurs in middle-aged persons comparably younger than in the general population in which CVD occurs in the sixth or seventh decade. In a study of human immunodeficiency virus–positive persons, we found that injection drug users had less ankle planar and dorsiflexion and inversion-eversion than those who did not inject drugs. A causal model supported the hypothesis of ankle mobility as a mediator of the effect of IDU on CVD. Significant impairment of quality of life occurred with leg pain causing increased functional impairment with worsening CVD; stair climbing and walking were also adversely affected. Leg pain reduced effectiveness of the calf muscle pump function. Low income and educational levels were common in our samples and are associated with less access to care and issues of health literacy. We currently have funding to test specific hypotheses linking leg pain, pump function, and general mobility to CVD progression in 600 persons with a history of drug abuse. We encourage researchers and clinicians to consider the plethora of complications of drug use in addition to blood-borne pathogens as persons who injected drugs continue to age because these complications have an important impact on quality of life and are an economic burden.

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Prisoners (Should) Count

It is difficult to understand a survey of injection drug users that ignores “institutionalized persons,” including, specifically, prisoners. The comment of the author that the excluded individuals “represent less than 2% of the US population” gives scant comfort. The incarcerated population in the United States numbers more than 2.3 million persons, and a significant proportion of the inmates are injection drug users. What could be the reason for excluding a cohort that includes so many of the individuals whose characteristics are being studied—especially when those individuals are, very literally, a captive population?

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In reply

I thank Pieper and colleagues for sharing their insights on the problem with CVD among injection drug users and for reminding readers that the medical, social, and psychiatric

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