A Population-based Study of Incidence, Risk Factors, Clinical Spectrum, and Outcomes of Ischemic Colitis

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BACKGROUND & AIMS: Little is known about progression of ischemic colitis (IC) among unselected patients. We aimed to estimate the incidence, risk factors, and natural history of IC in a population-based cohort in Olmsted County, Minnesota.

METHODS: We performed a retrospective population-based cohort and nested case-control study of IC. Each IC case was matched to 2 controls from the same population on the basis of sex, age, and closest registration number. Conditional logistic regression, the Kaplan–Meier method, and proportional hazards regression were used to assess comorbidities, estimate survival, and identify characteristics associated with survival, respectively.

RESULTS: Four hundred forty-five county residents (median age, 71.6 years; 67% female) were diagnosed with IC from 1976 through 2009 and were matched with 890 controls. The age-adjusted and sex-adjusted incidence rates of IC nearly quadrupled from 6.1 cases/100,000 person-years in 1976–1980 to 22.9/100,000 in 2005–2009. The odds for IC were significantly higher among subjects with atherosclerotic diseases; odds ratios ranged from 2.6 for individuals with coronary disease to 7.9 for individuals with peripheral vascular disease. Of IC cases, 59% survived for 5 years (95% confidence interval, 54%–64%), compared with 90% of controls (95% confidence interval, 88%–92%). Age >40 years, male sex, right-sided colon involvement, concomitant small bowel involvement, and chronic obstructive pulmonary disease were all independently associated with mortality ($P < .05$).

CONCLUSIONS: The incidence of IC increased during the past 3 decades in a population-based cohort in Minnesota. IC typically presents in older patients with multiple comorbidities and is associated with high in-hospital mortality (11.5%) and rates of surgery (17%).

Keywords: COPD; Epidemiologic Study; Cardiovascular Disease; Intestinal Vasculature.

Ischemic colitis (IC) accounts for approximately 50% of cases of vascular compromise to the intestine.[1] The condition typically manifests as bloody diarrhea and abdominal pain in elderly individuals who often have a history of atherosclerotic vascular disease, congestive heart failure, recent aortic or cardiopulmonary bypass surgery, or an episode of hypotension.[1–3] However, younger individuals may develop IC in other settings such as hypercoagulable states, collagen vascular diseases, long-distance running, cigarette smoking, constipation, and use of certain drugs, especially oral contraceptives.[4–7] There is a paucity of epidemiologic data derived from review of actual patient medical records, especially on the incidence and risk factors of IC in the general population. Most information is obtained from tertiary care inpatient

facilities or medical and pharmacy claims databases for which there may be a selection bias. Large database studies rely on the ascertainment of IC by using diagnostic codes that are not specific to IC (Supplementary Table 1), with limited or no medical record review, potentially leading to misclassification bias. A systematic review

published in 2004 noted that the reported incidence of IC in the general population varied from 4.5 to 44 cases per 100,000 person-years and concluded that the effect sizes of the most commonly reported risk factors were not adequately quantified in these population-based studies.[8] Because there has been no population-based study of patients with IC, we sought to estimate the incidence of IC in Olmsted County, Minnesota residents between 1976 and 2009, to describe the clinical features and natural history among unselected community patients, and to identify clinical variables that influence mortality in IC. We also performed a nested case-control study to assess the strength of association of putative risk factors with IC.

Methods

Study Setting and Design

By using the resources of the Rochester Epidemiology Project (REP),[9] we performed this population-based study in Olmsted County, Minnesota (population, 144,260 per 2010 U.S. census)[10,11] (Supplementary Materials). We developed a detailed protocol that included the hypothesis, definition of IC, risk factors, and all analytic procedures including sample size calculations before performing the study as recommended for high-quality studies.[12] We followed the STROBE checklist for reporting our study.[13]

Cases

After written approval by the Institutional Review Boards of Mayo Clinic and Olmsted Medical Center, the REP data system was used to identify all county residents with a diagnosis of IC or vascular insufficiency of the intestine between January 1, 1976 and December 31, 2009. Coding systems used during this period included the Hospital Adaptation of the International Classification of Disease, second edition and International Classification of Diseases, 9th Revision (ICD-9). Hospital Adaptation of the International Classification of Diseases, second edition codes for IC and vascular insufficiency of the intestine (5639-31 and 4442-xx) and the corresponding ICD-9 codes (557, 444.89) were used to identify potential cases (Supplementary Materials for case definitions).

Controls

Controls were randomly selected from the large pool of Olmsted County residents without IC who sought medical care at Mayo Medical Center or Olmsted Medical Center between January 1, 1976 and December 31, 2009 (Supplementary Materials).

Data Collection

For cases, the medical records were reviewed for date of diagnosis of IC, method of diagnosis, subsite of bowel ischemia, dates of hospitalization, date(s) and type of surgery, and date of last follow-up or death. For both cases and controls, the records were reviewed for the presence of potential risk factors before the index date (date of diagnosis of IC for cases and date of closest clinic visit for controls). A physician's diagnosis was used to define the risk factors (Supplementary Materials for definitions). Primary and secondary causes of death were recorded from death certificates. Study data were collected and managed by using Research Electronic Data Capture hosted at Mayo Clinic.[14]

Statistical Analysis

The incidence of IC was estimated by assuming that the entire Olmsted County population was at risk. Definite and probable cases of IC were included in the numerator, and person-years at risk based on decennial census numbers comprised the denominator. Potential risk factors for IC were evaluated by using conditional logistic regression analysis, including year of birth as a covariate in the model. The odds ratios (ORs) and 95% confidence intervals (CIs) are reported. Survival of the case cohort was estimated by using the product-limit (Kaplan–Meier) method. By using just the IC patients (cases), the association of clinical variables with patient survival was estimated by using multiple variable Cox proportional hazards regression. The data analysis was done in SAS version 9.2 (SAS Institute Inc, Cary, NC). The alpha level (P value) for statistical significance was set at .05. Additional details of the statistical analysis are provided in the Supplementary Materials.

Results

Demographics and Clinical Features of Ischemic Colitis

Between 1976 and 2009, 451 Olmsted County residents were first diagnosed with IC. Six patients (1.3%) withheld research authorization. Of the 445 patients, 67% of the IC patients were women. The median age of diagnosis was 71.6 years (range, 21.6–96.9 years), and 74% were older than 60 years at the time of diagnosis of IC. Patients usually presented with abdominal pain (73%), diarrhea (61%), rectal bleeding (71%), and abdominal tenderness (60%). Various diagnostic methods were used to diagnose IC, such as endoscopy (73%), surgery (16%), autopsy (7%), and radiology (4%). The ischemic changes were distributed throughout the colon but most prevalent in the transverse (39%), descending (56%), and sigmoid (45%) colon. Seventeen percent of patients underwent surgery, and in-hospital mortality was 11.5%. Table 1 provides the demographics and clinical features of the 445 IC cases in more detail.