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Hospitalization rates and utilization among patients with giant cell arteritis: A population-based study from 1987 to 2012

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ABSTRACT

Background: Patients with giant cell arteritis (GCA) may experience serious vascular and visual complications. It is unknown, however, to what extent the difficulties of the disease may lead to hospitalization. The goal of this study is to discern whether patients with GCA are at greater risk for all-cause hospitalizations when compared to the general population.

Methods: This retrospective, population-based cohort study utilized patients with large vessel or visual involvement who were diagnosed with GCA (as defined by the 1990 ACR criteria) between 1/1/1950 and 12/31/2009, and a reference cohort of patients without GCA matched on age, sex, and calendar year. Each patients' medical record was examined for hospitalizations from 1987 through 2012. For this analysis, follow-up began with the latter of index date or 1/1/1987 and ended at the earlier of death, emigration from Olmsted County, or 12/31/2012. Discharge diagnoses were grouped together using the Clinical Classifications Software (CCS) for ICD-9-CM from Healthcare Cost and Utilization Project (HCUP). Data were analyzed using person-year methods and rate ratios comparing GCA to non-GCA.

Results: The GCA cohort consists of 199 patients with a mean age of 76.2 (79.9% female) and follow-up of 8.2 years. The non-GCA cohort is comprised of 194 patients with a mean age of 75.7 (78.9% female) and follow-up of 8.6 years. The patients with GCA had 816 hospitalizations and the non-GCA patients had 737 hospitalizations. GCA patients proved to be at a marginally greater risk for all causes of hospitalization [rate ratio (RR) = 1.13; 95% confidence interval (CI): 1.02–1.25]; however, the rate of hospitalization for patients with and without GCA decreased significantly from 1987 to 2012.

Two specific discharge categories are of interest. First, transient cerebral ischemia is a greater risk of hospitalization for patients with GCA who had 16 hospitalizations compared to patients without GCA who only had 5 hospitalizations (RR = 3.06; 95% CI: 1.27–9.47). Second, patients with GCA (21 hospitalizations) are at greater risk of hospitalization for syncope than patients without GCA (5 hospitalizations) (RR = 3.98; 95% CI: 1.72–12.14).

Conclusion: In this first ever analysis of all-cause hospitalizations in a population-based cohort, patients with GCA appear to be at a marginally greater risk for hospitalization than patients without GCA, although the rate of hospitalization for GCA patients decreased from 1987 to 2012. Patients with GCA are at increased risk of hospitalization for both transient cerebral ischemia and syncope.

Introduction

Giant cell arteritis (GCA) is the most common form of idiopathic vasculitis. It primarily affects individuals of Northern European ancestry and those aged 50 years and older [1–6]. Usually targeting the branches of the external carotid artery, GCA can result in fatigue, headache, tenderness in the temporal region, and loss of vision. GCA affects mainly medium and large sized vessels, especially the aorta and its first order branches, and may result in aortic aneurysm, aortic dissection, and medium and large artery stenosis [7–10].

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Despite these associated risks, mortality in patients with GCA does not seem to differ from the general population [9,11,12]. Nevertheless, vascular and visual complications are serious concerns in the treatment of patients with GCA. These complications and comorbidities such as infection and cardiovascular disease may result in increased need for hospitalization. This study, therefore, aimed to examine for the first time hospitalizations for patients with GCA in order to determine whether there are differences in rates of admission between these patients and the general population.

Materials and methods

This is a retrospective, population-based cohort study including residents of Olmsted County, Minnesota. This is possible due to the resources of the Rochester Epidemiology Project, a medical records linkage system that contains the complete (inpatient and outpatient) medical records from all healthcare providers in Olmsted County including the Mayo Clinic and its affiliated hospital, the Olmsted Medical Center, local nursing homes and private practitioners [13,14].

The incident cohort consists of 245 patients with large vessel or visual involvement who were diagnosed with GCA between January 1, 1950 and December 31, 2009. Each patient fulfills the 1990 American College of Rheumatology criteria for GCA [15]. The reference cohort of 245 patients without GCA was matched by age, sex, and calendar year. Each non-GCA subject was assigned an index date corresponding to the GCA incidence date of the designated patient with GCA.

Data on hospitalizations (admission dates, discharge dates, and admission and discharge diagnoses) were retrieved electronically from billing data from Olmsted County medical providers including Mayo Clinic and Olmsted Medical Center and their affiliated hospitals and were available beginning in 1987. Of the original 245 patients with GCA and 245 subjects without GCA, those who died or emigrated from Olmsted County prior to 1987 were excluded (45 GCA and 46 non-GCA) as were those who declined to authorize the use of their medical records for research purposes per Minnesota statute sometime following their initial inclusion in the cohorts (1 GCA and 5 non-GCA). Each patients' medical record was examined for all-cause hospitalizations beginning in the year 1987 and continuing through 2012. For this analysis, follow-up began with the latter of index date or January 1, 1987 and ended at the earlier of death, migration from Olmsted County, or December 31, 2012.

Primary discharge diagnoses were grouped together using the Clinical Classifications Software (CCS) for ICD-9-CM from the Healthcare Cost and Utilization Project [16]. The CCS groups diagnoses into 18 chapters: infections and parasitic diseases; neoplasms; endocrine, nutritional, and metabolic diseases, and immunity disorders; diseases of the blood and blood-forming organs; mental illness; diseases of the nervous system and sense organs; diseases of the circulatory system; diseases of respiratory system; diseases of the digestive system; diseases of the genitourinary system; complications of pregnancy, childbirth, and puerperium; diseases of the skin and subcutaneous tissue; diseases of the musculoskeletal system and connective tissue; congenital anomalies; certain conditions originating in the perinatal period; injury and poisonings (which includes fractures); symptoms, signs, and ill-defined conditions; and residual codes, unclassified. The CCS also further subdivides diagnoses into 285 mutually exclusive categories. Readmissions were defined as hospital admissions occurring within 30 days of a previous hospital discharge.

Statistical methods

Descriptive statistics (mean percentages, etc.) were used to summarize the data. Data were analyzed using person-year methods and rate ratios comparing GCA to non-GCA. Comparisons of person-year rates were performed using Poisson methods. Poisson regression models with smoothing splines were used to examine trends over time to allow for non-linear effects. Comparisons of length of stay for GCA versus non-GCA were performed using generalized linear models adjusted for age, sex, and calendar year with random intercepts to account for multiple hospitalizations in the same patient. Readmission rates were calculated as the number of readmissions divided by the number of subsequent hospitalizations (not counting the first hospitalization for each patient, as it could not be a readmission by definition). Analyses were performed using SAS version 9.3 (SAS Institute, Cary, NC, USA) and R 3.0.2 (R Foundation for Statistical Computing, Vienna, Austria).

Results

The GCA cohort consists of 199 patients (79.9% female) with a mean age of 76.2 [standard deviation (SD), 8.3] years at start of follow-up and mean follow-up of 8.2 (SD 5.8) years. The non-GCA cohort is comprised of 194 patients (78.9% female) with a mean age of 75.7 (SD 8.8) years and follow-up of 8.6 (SD 6.6) years. The patients with GCA had 816 hospitalizations during 1641 person-years [py] of follow-up and the subjects without GCA had 737 hospitalizations during 1672 py. The average length of stay was 6 days among the GCA and non-GCA hospitalizations (median 4 days, 25th percentile 2 days, 75th percentile 7 days in both cohorts; $p = 0.64$).

Hospitalization rates were marginally higher in patients with GCA than patients without GCA [rate ratio (RR) = 1.13; 95% confidence interval (CI): 1.02–1.25] (Table 1). The overall rate of hospitalization decreased significantly for both patients with and without GCA from 1987 to 2012 (Fig.). However, the rate ratio of hospitalizations for GCA compared to non-GCA remained relatively stable except for a higher rate ratio in the earliest time period (1987–1991; RR = 1.26; 95% CI: 1.02–1.56). Men had higher hospitalization rates than women overall, but the rate ratios of hospitalizations for GCA compared to non-GCA were similar for

Table 1
Rate of hospitalization for patients with giant cell arteritis (GCA) and patients without GCA[a]

	GCA rate[b]	Non-GCA rate[b]	Rate ratio (95% CI)
Overall	49.7	44.1	**1.13 (1.02–1.25)**
Sex			
Female	47.2	42.5	1.11 (0.99–1.25)
Male	60.7	51.0	1.19 (0.96–1.47)
Ages			
50–64	15.6	16.6	0.95 (0.35–2.42)
65–84	45.2	40.9	1.10 (0.97–1.26)
85+	58.9	52.5	1.12 (0.96–1.30)
Calendar years			
1987–1991	67.1	53.1	**1.26 (1.02–1.56)**
1992–1996	55.7	49.2	1.13 (0.90–1.42)
1997–2001	47.4	40.2	1.18 (0.93–1.50)
2002–2006	46.6	50.0	0.93 (0.75–1.16)
2007–2012	39.5	33.1	1.19 (0.96–1.48)
Years after GCA diagnosis			
0–4	43.5	48.1	0.90 (0.77–1.06)
5–9	43.7	41.8	1.04 (0.85–1.27)
10–14	55.7	43.6	1.27 (1.00–1.61)
15–19	69.6	39.0	**1.78 (1.31–2.45)**
20+	91.6	41.6	**2.21 (0.51–3.21)**

[a] Statistically significant results are presented in bold font.
[b] Rate of hospitalizations per 100 person-years.