Non-Hodgkin’s Lymphoma in a Cohort of Vietnam Veterans

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Introduction

Results of studies of occupational groups exposed to phenoxy herbicides have raised concerns that Vietnam veterans may have an increased risk of developing non-Hodgkin’s lymphoma (NHL) because of possible exposure to the phenoxy herbicide Agent Orange, used in South Vietnam between 1966 and 1970.1-3 These concerns have been heightened by reports of an increased risk of NHL among Vietnam veterans.4,5 In the Centers for Disease Control Vietnam Experience Study (VES), the health of US Army Vietnam veterans was compared with that of Vietnam-era Army veterans who had not served in Vietnam. Although the VES was not designed to assess the risk of rare cancers among Vietnam veterans, the high level of concern about NHL led us to investigate and report the findings for NHL.

Methods

The study population consisted of 18,313 randomly selected, male US Army veterans (9,324 Vietnam veterans and 8,989 non-Vietnam veterans) who entered military service between January 1965 and December 1971. The VES included both mortality and health interview components, and the methods have been described in detail elsewhere.6,7

In this analysis, we combined mortality and interview data to determine the number of veterans with NHL in the cohort. Two hundred forty-six Vietnam veterans and 200 non-Vietnam veterans had died between separation from active duty and December 31, 1983, the closing date of the mortality component. A panel of physicians examined medical records of these veterans to determine the causes of death for each veteran.

In the interview component of the VES, we attempted to locate and contact all veterans not identified as deceased. Altogether, we interviewed 15,288 veterans (87.3 percent of eligible Vietnam veterans and 83.8 percent of non-Vietnam veterans) by telephone during 1985-86. If the veteran reported that he had been diagnosed with cancer, we asked him to describe the type of cancer that he had. To verify three self-reported cases of NHL and to identify other cases, we sought medical records for 47 veterans, including men who reported a malignant neoplasm of the lymphatic or hematopoietic tissues, men who reported a diagnosis of cancer of a site that could be NHL (e.g. lung, neck, stomach, lymph nodes), and men who reported a diagnosis of cancer but could not name a specific type or site. We could not
obtain medical records for six of the 47 veterans; none of the six had reported a lymphatic or hematopoietic cancer during the interviews. We made final diagnoses on the basis of pathology reports found in the medical records or, when no pathology report was available, the preponderance of evidence from the medical records. Pathology records were available in 31 of 41 (75.6 percent) of these medical records.

For analytic purposes, we divided the number of veterans with NHL (ascertained through either the mortality component or the interview) in each cohort by the sum of the number of veterans who had died and the number of veterans who had been interviewed (8,170 Vietnam veterans and 7,564 non-Vietnam veterans).

**Results**

We confirmed that all three veterans who had reported a history of NHL during the interview had been so diagnosed. A fourth veteran who, in the interview, had not specified the type of cancer had also been diagnosed with NHL. All four of these men were Vietnam veterans (Table 1). In the mortality study, three Vietnam veterans and one non-Vietnam veteran were found to have NHL. In total, seven Vietnam veterans and one non-Vietnam veteran were diagnosed with some type of NHL (p = 0.07, Fisher exact test (two-tailed)). On the basis of published age-specific cancer incidence data, about 3.9 cases of NHL would have been expected among Vietnam veterans (p = 0.10, Poisson) and about 3.5 cases would have been expected among non-Vietnam veterans (p = 0.14, Poisson).

All of the Vietnam veterans with NHL had begun their tour in Vietnam from 1966 to 1968. The men had served in a variety of military occupations, and no specific occupation predominated. Regarding pathology, two Vietnam veterans were diagnosed as having Burkitt’s lymphoma. On further pathologic review, one case was reported as possibly Burkitt’s lymphoma, and the second was reported as acute lymphoblastic leukemia (Table 1). The “latency period” was short for two Vietnam veterans (Table 1). One veteran first developed NHL eight months after arriving in Vietnam and a second Vietnam veteran had a “latency period” of 47 months.

**Discussion**

Although these results suggest an increased risk of NHL among Vietnam veterans, our findings should be interpreted with caution. The number of cases is small and, on review, one of the Vietnam veterans may have had lymphocytic leukemia rather than NHL. (These diseases are, however, closely related.) The time period between the beginning of the veteran’s tour of duty in Vietnam and the diagnosis of NHL should also be considered when interpreting these data, as the “latent period” for some of the cases presented here is much shorter than the usual period for environmentally caused cancers.

The collective evidence for an unusual risk of NHL among Vietnam veterans is inconsistent. Two other studies have shown that Vietnam veterans may be at an increased risk of NHL. Increased mortality from NHL was seen in a large study of US Marine Corps Vietnam veterans (proportionate mortality ratio (PMR) = 2.10; 95% confidence interval = 1.17–3.79), although the same investigators found a deficit of deaths from NHL in US Army veterans (PMR = 0.81; 95% CI = 0.63–1.04). An elevated risk of NHL in Vietnam veterans was also reported in a large population-based case-control study (Odds ratio = 1.47; 95% CI = 1.09–1.97). In contrast, a case-control study using subjects from Veterans Administration hospitals found a modest negative association between Vietnam service and NHL (OR = 0.72; 95% CI = 0.56–0.92).

We could only indirectly assess possible exposure of these veterans to Agent Orange while in Vietnam. Although most of the men served in Vietnam during the time (1967–69) and area (III Corps) of heaviest spraying, three of seven had non-combat military job titles that suggest they were unlikely to have been in contact with herbicides. Although the three men with combat-related job titles may have been exposed to Agent Orange, previous
work suggests that, with the exception of men whose military occupation entailed handling herbicides, most US Army combat troops who served in Vietnam were not heavily exposed to dioxin. Since no other factor in the Vietnam experience has been linked to the increased NHL risk, reasons for the excess found in this study and two other studies remain unclear.

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References


Endemic Giardiasis and Municipal Water Supply

G. Graham Fraser, MB, ChB, MSc, and Kenneth R. Cooke, MB, ChB, PhD

Introduction

Epidemics of waterborne giardiasis originating from water supplies have been clearly associated with surface catchments, treatment systems that do not eliminate Giardia cysts, and downstream contamination of the reticulation system. In contrast, there have been few tests of the hypothesis that surface catchment waters contribute to endemic giardiasis where treatment systems cannot eliminate cysts.

Giardia cysts have only recently been isolated from water supplies in New Zealand. No substantive epidemics attributable to giardiasis have yet been documented. Many municipal supplies use surface waters and simple treatment methods that would not reliably filter or deactivate giardia cysts.

The present study took advantage of a natural experiment—the divided water supply of the city of Dunedin, New Zealand—to test the hypothesis that endemic giardiasis might be transmitted by unfiltered municipal water supplies.

Methods

Dunedin (population 89,000) is supplied almost entirely by water from surface catchments. Most water is filtered by mechanical microstrainers (screen size 23 μm). Part of the city water is treated at a modern station (Mount Grand) using coagulation/flocculation and direct dual media filtration (anthracite and silica sand) that would normally be expected to remove any Giardia cysts present. All water supplies are chlorinated and fluoridated.

Records of all laboratory-proven cases of giardiasis from persons residing within the Dunedin municipal water supply were linked to records of surface water source contamination. Analysis of results was made using the Mantel-Haenszel test for trend and a computer program (Epi Info) for contingency table analysis.

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