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Original article

Impact of hospital case volume on testicular cancer outcomes and practice patterns

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Abstract

Background: Given the rarity of testicular germ cell tumors (TGCTs) and the complex aspects of management, we evaluate the effect of hospital TGCT case volume on overall survival outcomes and practice patterns.

Materials and methods: The National Cancer Database was queried for patients diagnosed with seminoma or nonseminomatous germ cell tumor (NSGCT). Hospitals were classified by case volume as high (99th percentile, ≥26.1 cases annually), high-intermediate (95–99th percentile, 14.6–26.0 cases annually), intermediate (75–95th percentile, 6.1–14.5 cases annually), low-intermediate (25–75th percentile, 1.8–6.0 cases annually), and low (25th percentile, <1.8 cases annually). The median (interquartile range) number of TGCT cases per institution per year was 3.4 (1.8–6.1).

Results: A total of 33,417 patients with TGCT diagnosed from 1,239 institutions met inclusion criteria. Despite worse disease characteristics of patients treated at higher volume institutions, hospital volume was positively associated with survival outcomes in more advanced cases of TGCT. In the overall cohort, compared to the high-volume hospitals, patients treated at high-intermediate, intermediate, low-intermediate, and low volume hospitals the hazard ratio for overall mortality was 1.28, 1.45, 1.48, and 1.83, respectively ($P < 0.05$). The association between survival and hospital volume was not apparent for seminoma or stage I NSGCT. Patients treated at higher volume hospitals were more likely to undergo surveillance for stage I seminoma, primary retroperitoneal lymph node dissection (RPLND) for stage I NSGCT, and postchemotherapy RPLND for stage II/III NSGCT.

Conclusions: Our analysis of a nationwide cancer registry demonstrated that increased hospital TGCT case volume was associated with significant differences in management strategies and improved survival outcomes, in particular for more advanced disease. © 2017 Elsevier Inc. All rights reserved.

Keywords: Testicular cancer; Volume; Centralization; Outcomes; Treatment

1. Introduction

Testicular germ cell tumors (TGCTs) are the most common malignancy among young men in the United States [1] and the overall incidence of testicular cancer diagnoses appears to be rising [2–4], with an estimated 8,850 new cases in 2017 [5]. Most publications on TGCT management and outcomes come from a few very high-volume institutions, with referral patterns, treatments, and outcomes which may not be generalizable to the most patients diagnosed with TGCT. Yet, most men diagnosed with TGCT are not cared for at these high-volume oncologic centers. We sought to review the degree to which TGCT care is centralized in the United States, and to assess the effect of TGCT-specific hospital volume on testicular cancer outcomes and treatment patterns.

2. Methods

2.1. Data source

Data was obtained from the National Cancer Database (NCDB) encompassing years 2004 to 2014. The NCDB is a

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national cancer registry sponsored by the American College of Surgeons (ACS) and the American Cancer Society that collects data on malignancies from ACS-Commission on Cancer (CoC) accredited facilities. It includes approximately 70% of all malignancies diagnosed in the United States from over 1,500 facilities [6]. Institutional Review Board approval was waived as NCDB data is deidentified for both patient and facility.

2.2. Study population

There were 62,727 reported cases of testis cancer screened for inclusion. Fig. 1 illustrates the case selection process. The International Classification of Disease for Oncology (third edition) was used to identify men diagnosed with TGCT. Patients with nontesticular cancers, spermatocytic seminoma, or sex cord/stromal tumors, or unspecified germ cell tumor were excluded. Patients with unspecified American Joint Committee on Cancer (AJCC) clinical staging or clinical stage 0 disease (i.e., intratubular germ cell neoplasia) were also excluded. Patients younger than 18 and older than 64 years of age were excluded. Patients with a Charlson-Deyo comorbidity score above 0 (5.9% of cohort) were excluded to minimize confounding of the survival analysis posed by patients with more severe comorbidities who tend to seek care at higher volume institutions. The CoC classifies patients according to the facility at which the malignancy was diagnosed and where the first-line treatment was provided. Patients who were not treated at the reporting facility (class of case "00") were excluded. In patients were treated at multiple CoC facilities, the NCDB reports the most recent treatment facility and/or the facility with the most complete records. Further information of CoC case classification and distribution of patients in the study is provided in Supplementary Table A.1.

2.3. Hospital TGCT case volume

Hospital volumes were calculated based on the annual number of testicular cancer cases seen averaged over a 10-year period. The median (interquartile range) number of TGCT cases per institution per year was 3.4 (1.8–6.1). Sensitivity analysis was performed to determine volume percentiles that differentiated hospital volumes with respect to overall survival (OS). To be among the 90, 95, and 99th percentiles for TGCT case volume, institutions would have to see an annual TGCT volume of 10.8, 14.6, and 26.1

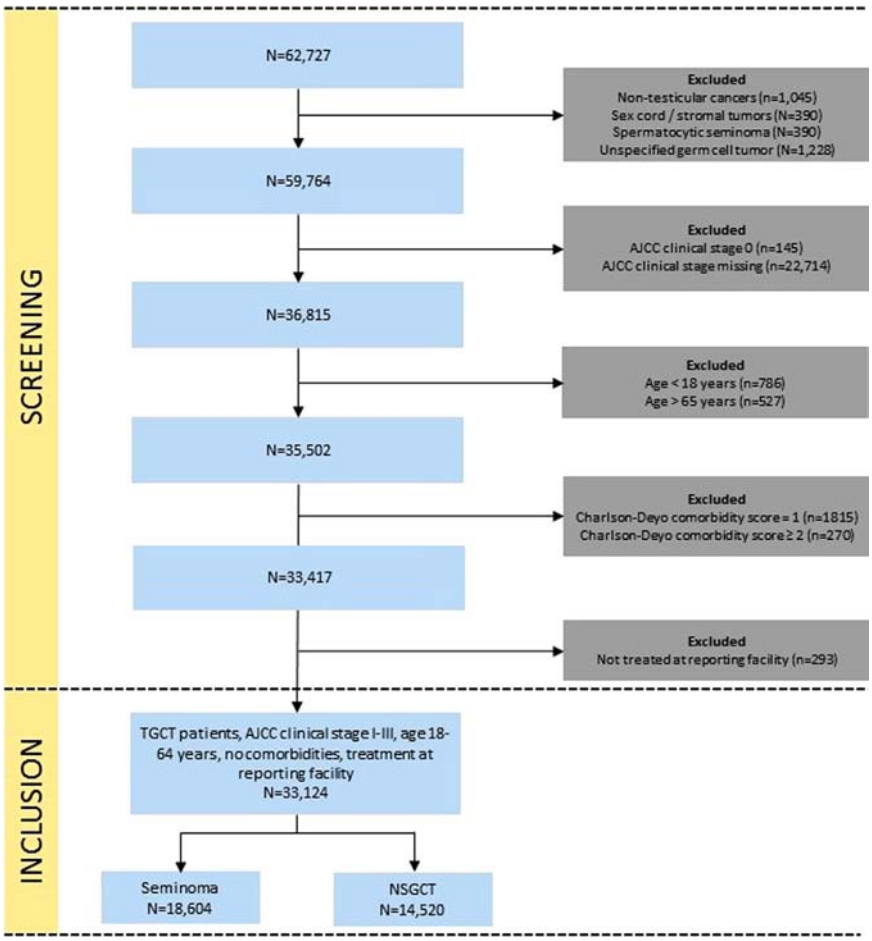

Fig.1. Patient selection flowchart of national cancer database analysis. (Color version of the figure available online.)

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