Predictors of Discharge Home after Blunt Traumatic Thoracic Aortic Injury

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Background: Blunt traumatic thoracic aortic injury (BTAI) can be a highly lethal injury but in the last decade major advances have been made in diagnostic accuracy, injury grading, and therapy. Traditionally, emphasis has been on studying survival postinjury with a paucity of studies examining the discharge characteristics of patients that survive a BTAI. The purpose of this study is to define the epidemiology and predictors of disposition in patients with BTAI in a provincial database.

Methods: Using the Ontario Trauma Registry, all patients were identified who were hospitalized with a BTAI between 1999 and 2009. Trends in therapy and discharge disposition were determined.

Results: We identified 264 cases of BTAI. Of these, 157 were discharged from hospital with 36% ($n = 56$) going directly home and 64% ($n = 101$) going to continuing care facilities. There was no difference in disposition in those with BTAI treated operatively or nonoperatively ($P = 0.48$). In those that had repair of BTAI, there was no difference in discharge home between open and endovascular repair ($P = 1.00$). Univariate analyses identified younger age, male sex, lower injury severity score (ISS), and lower Charlson comorbidity indices as being predictors of discharge home. On adjusted multivariate regression analysis, lower ISS (odds ratio, 0.91; 95% confidence interval, 0.87−0.95; $P < 0.001$) was the only independent predictors of discharge home.

Conclusions: Our findings suggest that the only independent predictor for discharge home for patients who survive is the overall severity of all their injuries irrespective of their condition on admission or management of their BTAI.

INTRODUCTION

Trauma to the descending thoracic aorta can be a devastating injury resulting in high prehospital and in-hospital mortality. They are responsible for 16% of deaths in motor vehicle collisions (MVCs) despite occurring in less than 1% of crashes.[1] Blunt traumatic thoracic aortic injury (BTAI) usually results from head-on MVCs where rapid deceleration forces are applied to the body. It is theorized that a combination of stretching, shearing, and torsion forces are responsible for the initial disruption of the aortic intima and medial layers which is followed by rupture of the adventitia.[2] Up to 80% of patients will die from a BTAI in the prehospital setting and current reports estimate a 20−40% in-hospital mortality rate.[1,3]

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Advances in diagnostic imaging and surgical treatment have led to renewed interest in defining the population characteristics and predictors of mortality in patients who sustain a BTAI. Despite the increased use of computed tomography (CT) angiography and its propensity to detect minimal aortic injuries that previously went undetected,[4] the incidence of BTAI does not appear to have changed over the last decade.[3] In addition, overall mortality in the endovascular repair era has not changed; however, those patients treated endovascularly appear to have lower mortality rates.[3,5] Furthermore, several groups have reported safe nonoperative management of some BTAI's.[6–8]

Traditionally, the emphasis on outcomes in BTAI has focused on mortality. There is a paucity of data that specifically addresses the outcomes of those patients who survive their injury. The objective of this study is to determine the predictors of discharge home in patients who sustain a BTAI using a prospectively maintained, large provincial trauma database.

MATERIALS AND METHODS

All BTAI patients were identified in the comprehensive data set (CDS) of the Ontario Trauma Registry (OTR) from January 1, 1999 to January 1, 2009 using *International Classification of Diseases* (ICD)-9 code 901.0 and ICD-10 code S25.0. The OTR is a database established, funded and maintained by the Ontario Ministry of Health and Long-Term Care (OMHLTC). It comprises 3 distinct data sets: (1) The minimum data set which is derived from a discharge abstract data set, (2) the CDS which is derived from OMHLTC used data abstractors from the 11 lead trauma centers in Ontario, and (3) the death data set which is maintained by the Office of the Chief Coroner for Ontario. They are mandated to report demographic, prehospital, and hospital care, and patient outcomes on all adult hospitalizations due to major trauma.[9] Patients were included in the OTR if they met the following criteria: (1) injury severity score (ISS) $\geq$12; (2) ICD external cause of injury code meeting the definition of trauma; and (3) one of (a) admitted to a participating trauma facility, or (b) treated in the emergency department of a participating facility but not admitted, or (c) died in the emergency department of a participating facility after treatment was initiated but before admission. Cases of BTAI that may not be captured by the OTR would include untreated cases of mortality (dead on arrival or dead at the scene). The data quality of the OTR is maintained by the Canadian Institute for Health Information.[9] The OTR has patient-level information on demographics, up to 27 injuries, procedures, and outcomes.[9] Discharge outcomes were grouped as patients discharged home (with or without support services) and those discharged to a continuing care facility (another acute care facility, general or special rehabilitation facilities, and nursing home or chronic care facility). Patients with operative repair of BTAI were identified by their ICD-9-CM and ICD-10-CA/CCI operative procedure codes (Table I). The ICD-10-CA is the Canadian version of the International Statistical Classification of Diseases and Related Health Problems and is accompanied by the Canadian Classification of Health Interventions.

Descriptive statistics were used to describe baseline demographic and prognostic data. For univariate analysis, all continuous data were normally distributed, and thus reported as means with associated standard deviations and analyzed using independent sample *t*-tests. Fisher's exact tests were used for univariate analysis of categorical data. Multivariable hierarchical logistic regression analysis was performed to adjust for confounding and to determine the independent predictors of discharge home in this population. The first hierarchy involved forced entry for those predictors that were chosen *a priori*: age, ISS, Charlson Comorbidity Index, systolic blood pressure at presentation to lead trauma hospital, Glasgow Coma Scale at the scene, year of BTAI, and whether they had operative management of BTAI. These were chosen a priori based on our theoretical framework of factors that we hypothesized would influence discharge status. The variable ''year of BTAI'' was included as a way to control for the effect of secular trends in the improvement of general medical and trauma care as time progresses as well as the potential changes in policies about discharge and transfer criteria over the years. The second level of hierarchy included all other significant factors identified on univariate analysis and backward elimination modeling method with likelihood ratios was used. Missing data were excluded case wise. A 2-sided alpha of 0.05 was used for all tests of significance. Analyses were performed using SPSS/PASW v.22 (IBM Corporation, Armonk, NY).

RESULTS

During the period of January 1999 to January 2009, there were 34,009 trauma hospitalizations in Ontario. We identified 264 cases of BTAI in the OTR between January 1999 and January 2009. All