Prospective analysis of the risk factors for falls in lymphoma patients

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ABSTRACT

Keywords:
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Purpose: To explore the risk factors for falls in lymphoma patients receiving chemotherapy.
Methods: Lymphoma patients (203) who received chemotherapy were prospectively recruited and analyzed. Eligible participants were followed up by weekly telephone contact for 6 months or until the time of a fall or death. Risk factors for falling in lymphoma patients were identified using univariate regression analysis and multivariate binary logistic regression analysis.
Results: Of the 203 cases, 13.3% (27 cases) had a fall during follow-up. Univariate regression analysis showed the following risk factors for falls in lymphoma patients: gender ($P = 0.023$), Eastern Cooperative Oncology Group (ECOG) performance status score ($P < 0.0001$), cancer stage ($P < 0.0001$), extranodal involvement ($P = 0.041$), serum lactate dehydrogenase (LDH) level ($P < 0.0001$), revised International Prognostic Index (R-IPI) ($P < 0.0001$), history of falls ($P < 0.0001$), gait ($P < 0.0001$), cognitive condition ($P = 0.029$) and intravenous catheter placement ($P < 0.0001$). Multivariate binary logistic regression analysis found four independent factors significantly associated with the risk of falling in lymphoma patients: female gender ($P = 0.042$), later stage ($P = 0.021$), R-IPI ($P = 0.030$), and intravenous catheter placement ($P = 0.001$).
Conclusions: Gender, stage, R-IPI, and intravenous catheter placement were independent risk factors for falls in patients with lymphoma. Lymphoma patients with these four risk factors should receive particular attention and fall prevention education to reduce the incidence of falls. The R-IPI may be a new predictor of falling in lymphoma patients and may aid in the management of falls.

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Introduction

A fall refers to any part of the body accidentally touching the ground or other items at a lower surface (Feder et al., 2000). Falls are the most common of adverse events, comprising 38% of all hospital adverse events, and they cause such negative repercussions as injury, prolonged hospital stays, diminished quality of life and greater healthcare costs (O'Connell and Myers, 2002; Schwendimann et al., 2006). Existing literature demonstrates that approximately 20–42% of people fall each year, and in the elderly population 15% fall more than once (Kalache et al., 2007; Overcash

and Beckstead, 2008; Tinetti, 2003; Weir and Culmer, 2004; Yano et al., 2006). The frequency of falls increases with age and frailty level (Kalache et al., 2007). Previous studies indicate that the main factors associated with falls common in older adults include age, gender, activities of daily living scores, depression, dementia, and history of falls (Barrett-Connor et al., 2009; French et al., 2007; Kalache et al., 2007; Kamel et al., 2013; van Doorn et al., 2003; Yagci et al., 2007). Although the incidence of falls appears to vary among different kinds of cancers, falls occur more often in patients with cancer than in community-dwelling older persons (Overcash, 2007; Overcash and Beckstead, 2008; Winters-Stone et al., 2011). Cancer treatment may increase the risk of a fall because the side effects of anticancer drugs can worsen risk factors. Approximately 23–58% of patients with cancer experience falls each year (Overcash, 2007; Overcash and Beckstead, 2008; Stone et al., 2011; Stone et al., 2012; Winters-Stone et al., 2011). In patients with cancer, leading risk factors for falls include age, poor function status

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of activities of daily living (ADL) (Overcash, 2007), depression (Lyness et al., 1997), dementia (Flood et al., 2006), primary brain tumor or brain metastasis, history of falls, cancer-related pain (Stone et al., 2012), and other cancer- or anti-cancer treatment-related risk factors (e.g., fatigue, weakness, anemia) (Pautex et al., 2008).

Although the pathogenesis of lymphoma has not been thoroughly elaborated, the incidence of lymphoma has increased in recent years, and while curative chemotherapy is effective, its side effects (such as myelosuppression, vomiting and fatigue) may result in loss of bodily strength in patients, resulting in falls which delay treatment. Falling is a major problem for nurses, and despite the many studies on fall prevention, most are focused on older adults in general or those in rehabilitation contexts. In contrast, lymphoma patients are characterized by their younger median age, higher intensity of chemotherapy, weaker post-chemotherapy status, and a relatively high cure rate compared to those treated for other cancers. Unsurprisingly, the characteristics of falling are different in lymphoma patients, and also fall prevention may involve factors different from those in other patient groups. Very few studies have been done on the risk of falling and associated factors in lymphoma patients receiving chemotherapy. This paper prospectively analyzes the characteristics and circumstances of falling in lymphoma patients, and explores and analyzes the risk factors.

Patients and method

Patients and design

We performed a prospective study of 203 consecutive cases with newly diagnosed lymphoma at the Sun Yat-Sen University Cancer Center (SYSUCC) between December 2009 and December 2011. All pathology and immunohistochemical (IHC) diagnoses were made in consultation with the Department of Pathology, SYSUCC, and all patients were diagnosed with lymphoma according to the World Health Organization (WHO) Classification of Lymphoma 2008. All included patients met the following criteria: (1) they were diagnosed according to 2008 WHO lymphoma classification; (2) they were <75 years old; (3) they received chemotherapy at SYSUCC; and (4) they agreed to participate in the research. Exclusion criteria included the following: (1) incomplete information for research, including lacking of relevant clinical data — e.g., no stage, no lactate dehydrogenase (LDH) level test result, no information on fall history or other comorbidities, specific pathological type, or specific treatment data; (2) pregnant or lactating women; (3) patients lost to follow-up; (4) patients with a history of brain/nervous system diseases (including stroke, cerebral hemorrhage, cerebral ischemia, etc.).

Eligible patients were interviewed weekly (by our researchers) from the date of baseline assessment, by telephone (after discharge) or in person (during hospitalization), to determine whether they had fallen during the preceding 7 days, and to record details of any fall that occurred. Follow-up continued until 6 months from the time of baseline assessment, or until the occurrence of a fall or death if these occurred before 6 months. The university Institutional Review Board approved the study protocol, and all patients provided written informed consent to participation.

For this study, a fall was defined as hitting the ground or other lower plane in an uncontrolled or unintentional manner, exceptions being in cases involving a violent strike (e.g., an attack or blow by another person or vehicle), loss of consciousness, sudden paralysis or epileptic seizure (Baldwin et al., 1996; Brady et al., 1993; Suzuki et al., 1997). The baseline clinical data collected for each patient included the following: age, gender, Eastern Cooperative

Oncology Group (ECOG) performance status (PS) score, ECOG Ann Arbor stage of cancer diagnosis (stage), subtypes of pathological diagnosis, presence of B symptoms (fever, night sweats, and weight loss), and LDH level. Extranodal involvement was collected *de novo* (defined as involvement of one or more extranodal tissues and/or organs), and prognostic index was calculated as the revised International Prognostic Index (R-IPI) score. At the same time, according to the Morse fall scale (MFS) — a widely used prediction model for falls (Morse et al., 1989) — other factors known to affect falls in patients were collected, including comorbidities, history of falls in the previous year, gait, mental state, intravenous catheter placement, and MFS. Conditions surrounding any fall endured by the 203 lymphoma patients over the 6 months of follow-up were recorded.

Assessment

The Mini Mental State Examination, an 11-item scale, was used to measure mental state. Scores lower than 24 of a possible 30 points indicate an impaired (or abnormal) cognitive function status (Folstein et al., 1975).

MFS consists of six items with scoring criteria as follows: (1) fall history (without = 0, with = 25); (2) more than one medical diagnosis (without = 0, with = 15 points); (3) use of walking aids (bed rest or activity not needing care by a nurse or a therapist = 0; use of crutches, canes, walkers = 15; walking with support of furniture = 30); (4) intravenous infusion or the use of a heparin lock (without = 0; heparin lock = 20 points); (5) gait (normal, bed rest and unable to move = 0; both lower limbs are weak and feeble = 10; disability or dysfunction = 20); and (6) cognitive status (oriented to their own ability = 0; overestimates ability or forgets restrictions = 15). The total score is 125 points, with higher scores indicating a greater risk of falls. Based on the Morse score, fall risk is divided into three groups: <25 (low risk); 25–44 (medium risk); and ≥45 (high risk) (Morse et al., 1989).

Statistical analysis and methods

All data analysis used the SPSS 17 statistical package for the social sciences (SPSS, Inc., Chicago, IL). A descriptive comparative design was used to describe the basic characteristics of patients and the incidence of falling. The possible influencing factors for falls underwent univariate regression analysis. Factors identified as significant in univariate regression analysis were included in the multivariate binary logistic regression analysis to find the fall-related risk factors. A *P*-value of <0.05 was defined as statistically significant.

Results

Clinical characteristics

The clinical characteristics of the study cohort are shown in Table 1. For the 203 lymphoma patients studied, the median age was 46 (range 13–71) years, with 151 (74.4%) aged ≤60 years and 52 (25.6%) aged >60 years. In all, 123 (60.6%) were female and 80 (39.4%) were male. The ECOG-PS score indicated that 173 (85.2%) patients scored 0–1; 30 (14.8%) patients scored >2. In terms of clinical characteristics, 69 patients (34%) had a stage I–II diagnosis, while 134 patients (66%) had a diagnosis of stage III–IV. In all, 91 (44.8%) had intravenous catheter placement. In terms of the R-IPI score, 36 patients (17.7%) had a score of 0, 124 (61.1%) scored 1–2 and 43 (21.2%) scored 3–5.

Falling situation

Among the 203 cases, 27 had a fall during follow-up, giving an incidence of falls of 13.3%. In these 27 patients, the median age was