

Morbidity and mortality following pelvic ramus fractures in an older Atlantic Canadian cohort

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Background: Pelvic ramus fractures in older patients are associated with substantial morbidity and mortality. There is a paucity of literature on fractures of the pelvis in this age group. The purpose of this study was to report mortality rates following such injuries. In addition, we aimed to describe and quantify the important resultant morbidity in this vulnerable population.

Methods: We performed a retrospective chart review of all low-energy pelvic ramus fractures in patients more than age 60 years that occurred between January 2000 and December 2005. Data on survival, hospital length of stay, ambulatory status and place of residence were recorded. For comparison, we calculated the mortality rate for a surrogate age- and sex-matched group using Statistics Canada survival data for use as an uninjured control group.

Results: We identified 43 patients (32 women [74%]; mean age 79.4 yr) with isolated low-energy pelvic ramus fractures over the study period. The 1- and 5-year mortality rates were 16.3% (95% confidence interval [CI] 7.8%–30.3%) and 58.1% (95% CI 43.3%–71.6%), respectively, both significantly higher than the point estimates for the control group (6.6% and 31.3%, respectively). Following injury, 14/39 patients (36%) permanently required increased ambulatory aids, and 8 (20%) required a permanent increase in everyday level of care.

Conclusion: The results suggest that there may be increased mortality and morbidity following low-energy pattern pelvic ramus fractures in an older population compared to age- and sex-matched uninjured control subjects.

Contexte : Les fractures du bassin chez les personnes âgées sont associées à une morbidité et une mortalité substantielles. La littérature sur les fractures du bassin dans ce groupe d'âge est peu abondante. Le but de cette étude était donc de faire état des taux de mortalité suite à de telles blessures. Nous avons aussi voulu décrire et quantifier l'importante morbidité qui en résulte chez cette population vulnérable.

Méthodes : Nous avons effectué une revue rétrospective de tous les cas de fractures du bassin consécutives à un traumatisme de faible énergie chez des patients de plus de 60 ans survenues entre janvier 2000 et décembre 2005. Les données de survie, la durée de l'hospitalisation, le statut ambulatoire et le lieu de résidence ont été notées. À des fins de comparaison, nous avons calculé le taux de mortalité pour un groupe témoin indemne assorti selon l'âge et le sexe en nous servant des données de survie de Statistique Canada.

Résultats : Nous avons recensé 43 patients (32 femmes [74%]; âge moyen 79,4 ans) porteurs de fractures du bassin isolées consécutives à un traumatisme de faible énergie pour la période de l'étude. Les taux de mortalité à 1 an et à 5 ans ont été de 16,3 % (intervalle confiance [IC] de 95 % 7,8 %–30,3 %) et 58,1 % (IC de 95 % 43,3 %–71,6 %), respectivement, tous deux significativement plus élevés que les estimations ponctuelles pour le groupe témoin (6,6 % et 31,3 %, respectivement). Après le traumatisme, 14 patients sur 39 (36 %) ont eu besoin de façon permanente et croissante de dispositifs d'aide à la marche et 8 (20 %) ont eu besoin de façon permanente d'un niveau de soins quotidiens accru.

Conclusion : Les résultats donnent à penser que la mortalité et la morbidité pourraient être plus marquées après une fracture de la hanche consécutive à un traumatisme de faible énergie chez la population âgée, comparativement à des témoins assortis selon l'âge et le sexe.

Low-energy osteoporotic fractures about the pelvic ring are greatly underrepresented in the current literature despite occurring with much greater frequency than high-energy pelvic injuries. The overall incidence of pelvic fractures is estimated to be 20–37/100 000 person-years; this number drastically increases among patients older than 60 years old, to 92/100 000 person-years, with another very large increase among those aged older than 85, to 446/100 000 person-years.^{1–3}

Krappingger and colleagues⁴ pooled data from 6 retrospective studies of pelvic ramus fractures ($n = 557$) to yield a 1-year mortality rate of 16.3%.^{4–11} The 6 studies, however, formed a very heterogeneous group. Two of the studies were from level 1 trauma centres involving patients who had a trauma team activation and/or had been involved in a motor vehicle accident,^{6,11} as opposed to the typical ground-level fall of most osteoporotic injuries. Other studies involved cohorts of varying ages (≥ 55 yr, > 60 yr,^{8,12} and 17–97 yr⁷).

In addition to the mortality associated with a pelvic fracture, there is substantial morbidity following this injury. The general heterogeneity of pelvic fractures combined with the gross underrepresentation of low-energy injuries in the literature has yielded few studies examining morbidity outcomes. The number of patients requiring ambulatory aids is a useful objective measure to assess postinjury mobility that is quite variably reported in the current literature. The available studies suggest that 39%–92% of patients maintain their prefracture level of mobility at 1 year.^{7,8,12,13} Another important metric in evaluating the impact of these injuries is hospital length of stay and discharge disposition. The mean length of hospital stay following an osteoporotic pelvic ring injury is reported from 0 to 45 days.^{2,6–8,14–17} There is similar variability in discharge disposition, with 37%–95% of patients returning home.^{2,7,8,14–17} The purpose of this study was to examine mortality following low-energy osteoporotic fractures of the pelvic ring and to determine their effect on ambulation and discharge disposition.

METHODS

Study design

We studied a retrospective cohort of all patients with pelvic ring injuries who presented in a health board region in eastern Newfoundland between January 2000 and December 2005. Following approval from the provincial research ethics authority, we used a health information coding database to identify all patients more than 60 years old with fractures about the pelvis. All injuries occurred during the 5-year period and were followed for 5 years.

Participants

We identified all patients older than 60 years of age with any type of fracture about the pelvis using a regional database in our health board region. The imaging, primarily plain film radiographs, was examined for each patient by an orthopedic surgery resident (C.B.H.) to delineate fracture pattern. The inclusion criterion was isolated pelvic ramus fracture with or without anterior compression fracture of the sacrum. Patients were excluded if they had concomitant fractures of the lower extremity, fracture involving the acetabulum or pelvic injury requiring surgical fixation.

All patients were treated nonoperatively with standard pain control and ambulation as tolerated with physiotherapy.

Variables

We collected all variables and outcome measures retrospectively from each patient's electronic and paper health records. The date of death was available for all patients who had died during the study period in their electronic medical record or in some cases by contacting the office of the local medical examiner. Preinjury ambulatory and residency status were documented by social workers or physical or occupational therapists at the time of injury. We determined postinjury ambulatory and residency status by combining information on discharge with follow-up clinic visits with orthopedic and geriatric medicine consultants. We obtained the length of stay in hospital and mechanism of injury from the patient's charts.

Using the date of injury and date of death, we calculated 1- and 5-year mortality rates. We then calculated 95% confidence intervals (CIs) using the adjusted Wald method and used them for comparison.

We calculated the mortality rate for a surrogate control group (age- and sex-matched uninjured cohort) using Statistics Canada census data. Using the methodology of Finkelstein and colleagues,¹⁸ we generated general population yearly survival rates to match the age and sex of those in our cohort from Statistics Canada life table data for Newfoundland and Labrador for 2009–2011¹⁹ (see Appendix 1, available at canjsurg.ca/011518-a1, for details of calculations).

RESULTS

We identified 80 fractures about the pelvis in patients older than 60 years of age over the study period, of whom 43 had isolated low-energy osteoporotic pelvic ring injuries. The remaining 37 patients were excluded for concomitant lower extremity fractures (17 patients), fractures involving the acetabulum (14) and concomitant hip fractures (6). Complete data for the study variables were available for all 43 included patients.

The mean patient age was 79.4 (standard deviation [SD] 9.2) years. The population was predominantly female (32 [74%]). All patients were admitted to hospital following their injury. The average length of stay in hospital or a rehabilitation facility was 38.1 (SD 38.0) days.

The 1- and 5-year mortality rates following injury in our population were 16.3% (95% CI 7.8%–30.3%) and 58.1% (95% CI 43.3%–71.6%), respectively. There were 4 in-hospital deaths (9%). Using census data from Statistics Canada for Newfoundland and Labrador, we estimated an age- and sex-matched uninjured population to have 1-, 2-, 3-, 4- and 5-year mortality rates of 6.6%, 12.9%, 19.1%, 25.3% and 31.3%, respectively. The improved survival of the general population relative to the study population is graphically illustrated in a survival curve (Fig. 1).

Following their injury, just over one-third of patients (14/39 [36%]) (95% CI 22.7%–51.6%) permanently required increased ambulatory aids. They went from walking independently to using a cane/walker (12 [31%]) or from ambulatory with assistance to being primarily confined to a wheelchair (2 [5%]).

There was a permanent increase in the everyday level of care required following injury in 8 patients (20%) (95% CI 10.5%–35.8%). These patients were previously living independently and subsequently had to move into an assisted-living or nursing facility (4 [10%]), or previously were residents of a low-level assisted-living facility and were required to move to a higher-level nursing home (4 [10%]).

DISCUSSION

Low-energy fractures about the pelvic ring are a grossly underrepresented group of injuries in the literature. Ade-

quately delineating the outcomes following these injuries will be an integral part of targeting and improving management options.

We found the 1- and 5-year mortality rates in our study population to be sizable, at 16.3% and 58.1%, respectively. These values, which are consistent with the current available literature, would certainly have us believe that this “stable” pelvic injury is not inconsequential. Bible and colleagues²⁰ reported a 1-year mortality rate of 12.9% among patients more than 60 years old with pelvic ring injuries. Their population was slightly younger than ours (mean age 73.1 yr v. 79.4 yr), and only 23% of injuries were subsequent to a ground-level fall, with the remaining patients incurring higher-energy injuries. With only 53% of pelvic fractures classified as lateral compression type 1, the overall heterogeneity of the injury patterns in that study do not allow for effective comparison with the low-energy fractures in our study.

Studer and colleagues²¹ studied a more homogeneous population, comprising patients older than 65 years with low-energy pelvic ring injuries. With a slightly older population (mean age 83.5 yr), they documented a 1-year mortality rate of 18.5%, similar to that in our study.

In our study and others, the 1-year mortality rate was far greater than our age- and sex-matched estimate of 6.6% generated with Statistics Canada census data. The increased mortality rate surrounding these injuries can be grossly explained by 1 of 2 rationales or some combination thereof: the injury causes such a great physiologic insult that the patient is ultimately unable to recover, or the low-energy pelvic fracture is simply a surrogate marker of frailty in patients who would soon succumb to failure of other organ systems independent of their injury.

Comparison to the extensive literature on hip fracture mortality is relevant, as the patient population is similar. In hip fractures, most sources would cite a 1-year mortality rate of about 20%, with reported values ranging from 19% to 50%.^{3,10,11,22}

Our findings document substantial morbidity following pelvic ramus fractures as data were available for all patients except those who died in hospital. The proportion of patients requiring increased ambulatory aids was 36%. This value closely matches that for older patients in 3 similar studies showing that 36%–40% of patients had a deterioration in their ambulatory status 1 year following pelvic fracture.^{7,12,13} Koval and colleagues⁸ reported that 8% of patients had deterioration in ambulatory status 1 year after pubic ramus fracture; however, 1-year follow-up data were available for only 60% of patients initially enrolled.

Mobility following fractures of the proximal femur is an often used parameter to compare varying surgical options. In studies comparing arthroplasty versus internal fixation for femoral neck fractures, it was determined that

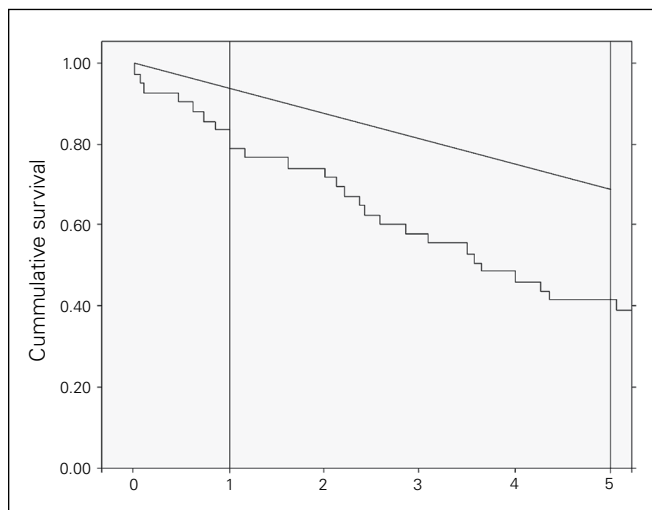


Fig. 1. Survival curve of study population (lower line) compared to age- and sex-matched Newfoundland and Labrador population (upper line).

there was no difference in the proportion of patients regaining previous levels of mobility, with an overall rate of 46%.^{22–25} This is substantially lower than the 64% of patients in our study who regained their previous level of mobility.

The similarity in mortality rate between pelvic ramus fractures and proximal femur fractures is likely largely related to the similarly frail populations that incur these 2 types of injury. The similarity ends, however, when the injuries themselves are taken into consideration. A patient with a proximal femur fracture is unlikely to ambulate again without surgical intervention owing to the gross mechanical instability of the lower limb following this injury. In contrast, the accepted treatment of pelvic ramus fractures involves mobilizing the patient as tolerated with pain control. The difference in mechanical stability immediately following injury between these fractures likely explains the improved rates of regained mobility in our pelvic fracture population.

The permanent level of care required following injury increased in 20% of our patients. Similar proportions of patients eventually returning to their original residences are reported in the literature (75%–95%).^{7,8,13} In the study by Studer and colleagues,²¹ the proportion of patients who returned home following injury was only 65%, compared to 88% in our study.

In determining targets for intervention to improve outcomes in patients with pelvic ramus fractures, we must organize our treatment based on what is driving these outcomes. In patients in whom the fracture is primarily a marker of frailty, providing access to improved multidisciplinary geriatric care may improve outcomes. Patients in whom the primary issue is the length of rehabilitation may benefit from interventions designed to shorten this process. There are several suggested surgical treatment options in studies that amount to little more than small case studies/series at present. These range from full open operative fixation interventions, to percutaneous hardware insertion, to percutaneous injection of polymethylmethacrylate.^{26–28} Walker and colleagues²⁹ recently used percutaneous transiliac–transsacral screws in 8 patients with sacral fragility lateral compression type 1 pelvic injuries and reported statistically significant improvements in pain scores and the proportion discharged home compared to their nonstandardized control group.

Limitations

The limitations of our study include the inherent issues in a retrospective chart review study. This dictates that the data lack the known homogeneity and potential additional information of a data set collected prospectively. In addition, the small sample limits the power of the study, resulting in wide CIs and large SDs.

CONCLUSION

This study confirms the considerable mortality following low-energy injuries to the pelvic ring and is consistent with previously published literature. The mortality rate approaches that among patients with hip fractures, a group that is demographically similar but has been researched more extensively. Importantly, the substantial morbidity documented in the current study highlights the major impact of this group of fractures. This information can be useful in counselling patients and their families following these injuries and in directing future study. Further epidemiological research, ideally with prospective data, should further elucidate targets for intervention in addition to fully characterizing the resource and economic burden that these injuries have on health care systems.

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Competing interests: None declared.

Contributors: C. Hamilton and A. Furey designed the study. C. Hamilton acquired the data, which all authors analyzed. C. Hamilton wrote the article, which all authors reviewed and approved for publication.

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