Modes of failure of hip hemiarthroplasty for femoral neck fracture

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Background: Hemiarthroplasty is a common treatment for displaced femoral neck fractures, but limited Canadian data are available about hemiarthroplasty failure. We evaluated the frequency and predictors of hemiarthroplasty failure in Manitoba.

Methods: In this retrospective multicentre province-wide study, billing and joint registry databases showed 4693 patients who had hemiarthroplasty for treatment of femoral neck fracture in Manitoba over an 11-year period (2005–2015), including 155 hips with subsequent reoperations (open or closed) for treatment of hemiarthroplasty failure. Hospital records were reviewed to identify modes of hemiarthroplasty failure, comorbidities and reoperations. Data were analyzed using χ^2 test and Poisson and γ regression models.

Results: During our study period, 155 hips (154 patients [3%]) underwent 230 reoperations. Of these, 131 hips (85%) initially had an uncemented unipolar modular implant. Indications for first-time reoperation included periprosthetic femur fracture (49 hips [32%]), dislocation (45 hips [29%]), acetabular wear (28 hips [18%]) and infection (26 hips [17%]). There were 46 hips (30%) that had 2 or more reoperations. Reoperation for dislocation was associated with presence of dementia; acetabular wear was associated with absence of dementia. Time from hemiarthroplasty to reoperation was associated inversely with age at hemiarthroplasty, dislocation and dementia and was directly associated with acetabular wear. The risk of having 2 or more reoperations was associated independently with dislocation, infection, and alcohol abuse.

Conclusion: Hemiarthroplasty for femoral neck fracture in Manitoba had a low frequency of failure. Risk factors for multiple reoperations included dislocation, infection and alcohol abuse.

Contexte : L'hémiarthroplastie est un traitement courant pour les fractures déplacées du col fémoral, mais on dispose de peu de données canadiennes au sujet de l'échec de cette intervention. Nous avons évalué la fréquence et les prédicteurs de l'échec de l'hémiarthroplastie au Manitoba.

Méthodes : Pour cette étude rétrospective multicentrique menée à l'échelle de la province, les bases de données de facturation et les registres orthopédiques ont montré que 4693 patients avaient subi une hémiarthroplastie pour le traitement d'une fracture du col fémoral au Manitoba sur une période de 11 ans (2005–2015), dont 155 hanches qui ont par la suite dû être réopérées (intervention ouverte ou fermée) pour le traitement d'un échec de l'hémiarthroplastie. On a passé en revue les dossiers hospitaliers pour identifier les types d'échec de l'intervention, les comorbidités et les réinterventions. Les données ont été analysées à l'aide du test du χ^2 et des modèles de Poisson et de régression en γ.

Résultats : Durant la période de notre étude, 155 hanches (154 patients [3%]) ont subi 230 réinterventions. Parmi elles, 131 hanches (85 %) ont reçu un implant modulaire unipolaire non cimenté. Les indications d'une première réintervention incluaient fracture du fémur périprothétique (49 hanches [32 %]), dislocation (45 hanches [29 %]), usure acétabulaire (28 hanches [18 %]) et infection (26 hanches [17 %]). Quarante-six hanches (30 %) ont dû faire l'objet de 2 réinterventions ou plus. La réintervention pour dislocation a été associée à la présence de démence; l'usure acétabulaire a été associée à l'absence de démence. L'intervalle entre l'hémiarthroplastie et la réintervention était inversement associé à l'âge au moment de l'hémiarthroplastie, à la dislocation et à la démence, et directement associé à l'usure acétabulaire. Le risque de subir 2 réinterventions ou plus était indépendamment associé à la dislocation, à l'infection et à la consommation d'alcool.

Conclusion : L'hémiarthroplastie pour les fractures du col fémoral au Manitoba a connu un faible taux d'échec. Les facteurs de risque à l'égard des réinterventions incluaient la dislocation, l'infection et la consommation d'alcool.

Acute displaced intracapsular femoral neck fractures comprise almost half of all hip fractures, and most of these fractures in elderly patients in the developed world are treated surgically with hip hemiarthroplasty, total hip arthroplasty, or internal fixation.[1–4] Hemiarthroplasty is also performed for femoral neck nonunion, failed screw fixation and pathologic femoral neck fracture.

There is controversy about the optimal surgical technique for hemiarthroplasty, including surgical approach (anterior, lateral or posterior), endoprosthesis head (unipolar modular, unipolar monoblock, or bipolar) and stem fixation (cemented or uncemented).[5] Femoral component fixation in hemiarthroplasty outside North America commonly involves use of cement,[6–8] but uncemented, press-fit fixation frequently is used in North America.[9] The most common causes for hemiarthroplasty reoperation globally include acetabular wear, infection, instability, aseptic loosening and periprosthetic fracture, but limited Canadian data are available about hemiarthroplasty failure modes.[10]

We hypothesized that hemiarthroplasty for femoral neck fracture in Manitoba has infrequent failure and that the failure rate may be comparable to that in other geographic regions. The purpose of this study was to determine the frequency and predictors of modes of failure of hemiarthroplasty in Manitoba.

Methods

Patients

This study was a retrospective medical record review of patients who underwent hemiarthroplasty for treatment of a femoral neck fracture in the province of Manitoba over an 11-year period (Jan. 1, 2005, to Dec. 31, 2015) and who required subsequent orthopedic procedures on the ipsilateral hip. Data were collected from March to October 2017, which was a mean of 7 ± 3 years after the hemiarthroplasty. We identified all documented patients by querying the Manitoba Joint Replacement Registry and Manitoba Health Medical Claims Registry with 4 primary billing codes for hemiarthroplasty (0870 fracture, femur, neck, prosthetic replacement; 1149 total hip arthroplasty, femoral head replacement type; 1423 bipolar hip arthroplasty; 1424 unipolar hip arthroplasty) and 8 secondary billing codes for the subsequent procedures (1154 total hip arthroplasty, when previous uncemented Austin Moore prosthesis, cup, or plates require removal; 1175 arthrodesis, hip; 1332 dislocation, hip, closed reduction; 1334 dislocation, hip, open reduction; 1414 revision of hemiarthroplasty to total hip; 1415 total hip arthroplasty; 1422 removal of hip prosthesis without replacement; 1425 resection, femoral head [Girdlestone procedure]).[11] As the Manitoba Health Medical Claims Registry data did not distinguish between subsequent procedures performed on the ipsilateral versus contralateral hip, the side of the subsequent procedure was determined from manual review of paper medical records and operative reports for patients who had a subsequent procedure. The query showed 4693 patients who had hemiarthroplasty for treatment of a femoral neck fracture, and we included all 155 hips (154 patients) that underwent hemiarthroplasty for acute femoral neck fracture, pathologic femoral neck fracture, or complications of previous treatment of femoral neck fracture, such as femoral neck nonunion or hardware cutout, and had subsequent reoperation for hemiarthroplasty failure. There was 1 patient who had bilateral asynchronous hemiarthroplasties for femoral neck fractures, with the right occurring 26 months before the left femoral neck fracture, and both sides required subsequent procedures; these 2 hips were treated independently in the analyses because there was no temporal or apparent clinical association between the right and left femoral neck fractures other than medical comorbidities. There were 12 additional patients who were excluded from the study because they had operations that were total hip arthroplasties miscoded as hemiarthroplasty or were on the contralateral hip and unrelated to the hemiarthroplasty.

Evaluation

Hospital records were reviewed to confirm that the identified patients had a hemiarthroplasty and subsequent orthopedic procedure on the ipsilateral hip. A reoperation was defined as any procedure after the hemiarthroplasty and included fixation of periprosthetic fracture, closed or open reduction of dislocation, irrigation and débridement for infection, and revision of any components. Information from the records was extracted, including mode of failure of the hemiarthroplasty and indications for reoperations including periprosthetic fracture, dislocation, acetabular wear and infection. In addition, hospital records were reviewed for clinical factors associated with risks of hemiarthroplasty failure, such as presence of diabetes, inflammatory arthritis, steroid use, smoking, dementia, seizure disorder, stroke, radiation treatment, history of falls, alcohol abuse and noncompliance with hip precautions. Radiographs were not analyzed because they were unavailable or of insufficient uniformity of technique or quality for standardized measurements of radiographic parameters for 122 of 230 reoperations (53%).

Statistical analysis

Data analysis was performed using statistical software (STATA/IC, version 15.1, StataCorp). Data were reported as numbers and percentages of hips or as means

with standard deviations (SD). Associations between comorbidities or surgical approach and indications for reoperation were evaluated using χ^2 test or modified univariable or multivariable Poisson regression to compute incidence rate ratios (IRRs) that accounted for the possible correlation between multiple operations in the same patient.[12] The association between covariates and time from hemiarthroplasty to reoperation was evaluated using multivariable mixed-effects γ regression, nested by patient to control for multiple operations in individual patients; γ regression is a generalized linear model that may correct for non-normal distribution of data. The relation between independent variables and the risk of the binary outcome (≥ 2 reoperations v. 1 reoperation) was modelled with multivariable mixed-effects binary Poisson regression, with reoperations clustered within patient and with robust standard errors, to compute risk ratios adjusted for potential confounding variables. Risk ratios and IRRs are reported with standard errors (SE) and 95% confidence intervals (CIs). Results were considered statistically significant at $p < 0.05$.

Ethics approval

The study was reviewed and approved by the University of Manitoba Health Research Ethics Board.

Results

The registry query showed 4693 patients who underwent hemiarthroplasty for a femoral neck fracture at 7 hospitals in the province. Reoperations on the ipsilateral hip after hemiarthroplasty were performed in 155 hips (154 patients [3%]). Most hips with reoperation were in women who had a unipolar modular uncemented hemiarthroplasty for an acute femoral neck fracture and first reoperation at a mean of 1.5 years after the hemiarthroplasty (Table 1 and Table 2). Most hips had only 1 or 2 reoperations, but 17 hips (11%) had 3 or more reoperations (Table 1). The most frequent indications for the first reoperation included periprosthetic femur fracture, dislocation, acetabular wear, or infection (Table 3).[13] In the 46 hips (30%) that had 2 or more reoperations, the most frequent indications included dislocation or infection (Table 3). The 230 reoperations for treatment of complications in the 155 hips mostly included revision arthroplasty, closed reduction of hip dislocation, or open treatment of infection (Table 4).

Evaluation of the association between comorbidities and indications for reoperation showed that first-time reoperation for dislocation was significantly more frequent in hips of patients who had dementia (20 dislocations in 44 hips [45%]) than in those who did not have dementia (25 dislocations in 110 hips [23%]; $p = 0.005$; comorbidity data missing for 1 hip in 1 patient). In all 229 reoperations for

Table 1: Demographic and clinical characteristics of patients who had hip hemiarthroplasty and subsequent ipsilateral hip reoperations*

Characteristic	No. (%) of hips†
Sex	
Women	120 (77)
Men	35 (23)
Side	
Right	85 (55)
Left	70 (45)
Age, yr, mean ± SD	
Hemiarthroplasty	76 ± 11
First reoperation	78 ± 10
Time from hemiarthroplasty to first reoperation, mo	18 ± 26
Comorbidities at hemiarthroplasty‡	
Dementia	44 (29)
Diabetes mellitus	29 (19)
Smoking	23 (15)
Stroke	22 (14)
Alcohol abuse	9 (6)
History of falls	7 (5)
Parkinson disease	6 (4)
Inflammatory arthritis	5 (3)
Steroid use	5 (3)
Noncompliance with precautions	4 (3)
Seizure disorder	4 (3)
Radiation therapy	3 (2)
Indication for hemiarthroplasty	
Acute femoral neck fracture	146 (94)
Femoral neck nonunion	6 (4)
Femoral neck fixation failure	2 (1)
Pathologic femoral neck fracture	1 (1)
Surgical approach for hemiarthroplasty§	
Lateral	95 (62)
Posterior	57 (37)
Anterior	2 (1)
No. of reoperations¶	
1	109 (70)
2	29 (19)
3	10 (6)
4	4 (3)
5	2 (1)
6	0 (0)
7	1 (0.6)

SD = standard deviation.
**n* = 155 hips in 154 patients. Reoperation defined as open or closed treatment for a complication of hemiarthroplasty.
†Unless indicated otherwise.
‡Comorbidity data missing for 1 hip.
§Surgical approach missing for 1 hip.
¶Total of 230 reoperations in 155 hips.

Table 2: Implants and fixation used in hemiarthroplasty*

	Unipolar†			
Fixation	Modular	Monoblock	Bipolar	Total
Uncemented	131 (85)	12 (8)	2 (1)	145 (94)
Cemented	8 (5)	0 (0)	2 (1)	10 (6)
Total	139 (90)	12 (8)	4 (2)	155 (100)

**n* = 155 hips in 154 patients. Data reported as no. (%) of hips.
†Total of 151 unipolar implants (97%).

Table 3: Indications for reoperation after hemiarthroplasty*

Diagnosis	Reoperation 1, no. (%)†	Reoperation 2–7, no. (%)‡
Periprosthetic femur fracture	49 (32)	8 (11)
Dislocation	45 (29)	51 (68)
Acetabular wear	28 (18)	0 (0)
Infection	26 (17)	23 (31)
Aseptic loosening	5 (3)	1 (1)
Acetabular fracture	5 (3)	2 (3)
Other	6 (4)§	3(4)¶
Total reoperations	155 (100)	75 (100)

*n = 155 hips in 154 patients. Reoperation defined as open or closed treatment for a complication of hemiarthroplasty.

†Total diagnoses > 155 reoperations (100%) because there were 164 diagnoses in 155 first reoperations (155 hips). There were 9 hips that had reoperation for 2 diagnoses: periprosthetic femur fracture with dislocation (2 hips), acetabular wear (2 hips) or infection (2 hips), dislocation with infection (2 hips), and infection with acetabular fracture (1 hip).

‡Total diagnoses > 75 reoperations (100%) because there were 88 diagnoses in 75 second to seventh reoperations. There were 13 hips that had reoperation for 2 diagnoses: dislocation with periprosthetic femur fracture (5 hips), infection (4 hips), acetabular fracture (1 hip), or acetabular defect (1 hip), periprosthetic femur fracture and infection (1 hip), and aseptic loosening and acetabular fracture (1 hip).

§Stem subsidence (3 hips), implant instability with femoral stem rotated 90° on the immediate postoperative radiograph (1 hip), wrong taper sleeve used (mismatch between C-Taper of the stem and V40 taper of the sleeve inserted with the head[13]) (1 hip), and severe stiffness with heterotopic ossification (1 hip).

¶Wound dehiscence (2 hips), and acetabular defect (1 hip).

Table 4: Reoperations for hemiarthroplasty failure*

Treatment	Reoperation 1, no. (%)	Reoperation 2–7, no. (%)
Revision arthroplasty	**98 (63)**	**31 (41)**
Femur only	38 (25)	4 (5)
Acetabulum only	35 (23)	20 (27)
Femur and acetabulum	24 (15)	3 (4)
Sleeve only	1 (1)	0 (0)
Head and sleeve	0 (0)	1 (1)
Liner only	NA	3 (4)
Treatment of hip dislocation	**29 (19)**	**20 (27)**
Closed reduction	29 (19)	14 (19)
Open reduction	0 (0)	5 (7)
Resection arthroplasty	0 (0)	1 (1)§
Open treatment of infection†	**26 (17)**	**24 (32)**
Modified stage 1 revision	7 (5)	0 (0)
I & D, head exchange	6 (4)	2 (3)
Stage 1 revision	5 (3)	5 (7)
Single-stage revision	4 (3)	0 (0)
I & D, no component exchange	2 (1)	1 (1)
I & D, wound and closure	1 (1)	3 (4)
Resection arthroplasty	1 (1)	2 (3)§
I & D, head and liner exchange	NA	3 (4)
Stage 2 revision	0 (0)	8 (11)
ORIF of periprosthetic femur fracture	**2 (1)**	**0 (0)**
Total‡	**155 (100)**	**75 (100)**

I & D = irrigation and débridement; NA = not applicable; ORIF = open reduction and internal fixation.

*n = 155 hips in 154 patients. Reoperation defined as open or closed treatment for a complication of hemiarthroplasty.

†Stage 1 revision included I & D, removal of femoral component, and insertion of prosthesis of antibiotic-loaded acrylic cement or equivalent. Modified stage 1 revision included I & D, retention of the femoral component, and insertion of a cemented acetabular liner. Stage 2 revision included I & D and revision arthroplasty. Single-stage revision included I & D and revision arthroplasty in 1 operation.

‡Total for all reoperations combined: 230 procedures, including 187 open (81%) and 43 closed procedures (19%) (closed reductions).

§Resection arthroplasty for treatment of infection with dislocation (2 hips) and dislocation alone (1 hip).

which comorbidity data were available, reoperation for infection was significantly more frequent in patients who had a history of seizures (7 reoperations for infection in all 7 reoperations in patients with seizures [100%]) than in patients who did not have seizures (42 reoperations for infection in 222 reoperations in patients with no seizures [19%]; $p < 0.001$). In the 229 reoperations, reoperation for acetabular wear was significantly more frequent in patients who did not have dementia (28 reoperations for acetabular wear in 151 reoperations in patients with no dementia [19%]) than in patients who had dementia (0 reoperations for acetabular wear in 78 reoperations in patients with dementia [0%]); all 28 reoperations for acetabular wear were in patients who did not have dementia ($p < 0.001$). In all 229 reoperations with data available about the primary hemiarthroplasty surgical approach, there were 96 reoperations for dislocation in 229 reoperations (42%), including 66 of 147 reoperations (45%) after lateral approach, 27 of 78 reoperations (35%) after posterior approach, and 3 of 4 reoperations (75%) after anterior approach (not significant). Univariable mixed-effects Poisson regression showed that the likelihood of reoperation for acetabular wear was inversely associated with age at hemiarthroplasty (IRR 0.94 ± 0.02, 95% CI 0.90–0.98, $p = 0.002$) and age at reoperation (IRR 0.95 ± 0.02, 95% CI 0.92–0.99, $p = 0.016$) and directly associated with time between hemiarthroplasty and reoperation (IRR 1.026 ± 0.005, 95% CI 1.017–1.036, $p < 0.001$).

Multivariable mixed-effects γ regression for first and all reoperations showed that time from hemiarthroplasty to reoperation was inversely associated with age at hemiarthroplasty, dislocation, and dementia as the indication for reoperation (risk ratio < 1), and directly associated with acetabular wear (risk ratio > 1) (Table 5). Infection was inversely associated with time from hemiarthroplasty to reoperation for all reoperations, but not for first reoperation (Table 5). Multivariable mixed-effects binary Poisson regression showed that the risk of 2 or more reoperations compared with 1 reoperation was significantly associated with dislocation, infection and alcohol abuse (Table 6).

Discussion

The present study showed that reoperations for treatment of complications after hemiarthroplasty were performed in 3% of patients. Previous studies reported a comparable frequency of reoperation after hemiarthroplasty from 1.3% to 6% of hips.[1,9,14–16] Varied factors may contribute to increased complications and reoperation, including patient comorbidities, such as congestive heart failure and alcohol abuse; surgical technique;

Table 5: Multivariable mixed-effects gamma regression: relation between covariates and time from hemiarthroplasty to reoperation*

	First reoperation (n = 154)		All reoperations (n = 229)	
Covariate	Risk ratio ± SE (95% CI)	p value	Risk ratio ± SE (95% CI)	p value
Age at hemiarthroplasty	0.98 ± 0.01 (0.95–1.00)	0.046	0.97 ± 0.01 (0.95–0.99)	0.001
Dislocation	0.32 ± 0.09 (0.18–0.56)	< 0.001	0.5 ± 0.1 (0.30–0.81)	0.006
Dementia	0.5 ± 0.1 (0.3–0.9)	0.012	0.4 ± 0.1 (0.27–0.72)	0.001
Acetabular wear	4 ± 1 (1.8–7.5)	< 0.001	2.4 ± 0.8 (1.3–4.5)	0.005
Infection	0.6 ± 0.2 (0.33–1.3)	0.2	0.6 ± 0.1 (0.37–0.96)	0.033

CI = confidence interval; SE = standard error.

*n = 229 reoperations including 154 first reoperations in 154 hips; 1 additional hip had 1 reoperation that was excluded because of missing risk factor data.

Table 6: Multivariable mixed-effects binary Poisson regression for risk ratio of ≥ 2 reoperations versus 1 reoperation*

Covariate	Risk ratio ± SE (95% CI)	p value
Dislocation	4.3 ± 0.9 (2.9–6.3)	< 0.001
Infection	3.1 ± 0.7 (2.0–4.9)	< 0.001
Alcohol abuse	1.8 ± 0.3 (1.3–2.4)	< 0.001
Dementia†	1.1 ± 0.2 (0.81–1.6)	0.48

CI = confidence interval; SE = standard error.

*n = 229 reoperations in 154 hips (154 first reoperations in 154 hips; ≥ 2 reoperations, 75 reoperations in 46 hips); 1 additional hip had 1 reoperation that was excluded because of missing risk factor data. Results shown only for significant covariates except dementia.

†For the 229 reoperations, 101 reoperations were for hips in patients with no dementia and no dislocation; 46 reoperations with dementia and dislocation; 32 reoperations with dementia and no dislocation; and 50 reoperations with dislocation and no dementia (χ^2 test, $p < 0.001$). Therefore, the predictor variables (independent variables) dementia and dislocation were colinear (associated with each other) and could not independently predict the risk of the dependent variable (≥ 2 reoperations) in the regression model.

implant type; and fixation method,[3,9,14,16–22] whereas surgeon experience, operative volume and timing of surgery may or may not contribute to the frequency of complications and reoperation.[23,24] Although most hemiarthroplasties in the present study were uncemented unipolar and modular, variation of implant type has been reported, such as the common use of unipolar monoblock or modular stems in Australia[14] and bipolar stems in Norway,[25] with cemented fixation commonly used in Norway and the United Kingdom.[1,2,22,25]

In our study, the most frequent cause of hemiarthroplasty failure necessitating additional operative (closed or open) procedures included periprosthetic femur fracture, dislocation, acetabular wear and infection. Periprosthetic femur fracture may be affected by implant design, broach-implant mismatch, uncemented hemiarthroplasty, surgeon experience with uncemented stems, and patient factors such as osteoporosis.[6,7,26–31] The number of periprosthetic femur fractures in the present study represents fractures that were treated with reoperation and does not include intraoperative periprosthetic femur fractures that were treated with cerclage wiring or conversion to a different stem during the hemiarthroplasty or postoperative periprosthetic femur fractures that were treated nonoperatively. The hemiarthroplasty was uncemented in most hips in this study, and perioperative periprosthetic femur fractures typically are associated with uncemented fixation.[29,32] However, the present frequency of 49 hips with periprosthetic femur fractures (first reoperation) in 4693 patients who had hemiarthroplasty (1%) is lower than the 4% frequency reported previously in the UK.[7] In contrast with surgeons in other countries,[33] Canadian orthopedic surgeons use uncemented stems with 2.6-fold higher frequency than cemented stems in hemiarthroplasties for hip fractures.[34] Therefore, surgeon experience with the use of uncemented stems may be a factor associated with decreased frequency of postoperative periprosthetic femur fracture.

The observed association between hemiarthroplasty dislocation and dementia is consistent with previous reports.[35,36] However, we did not observe a higher frequency of dislocation with the posterior versus lateral or anterior approaches reported previously,[37,38] possibly because most hemiarthroplasties in the present study were performed by experienced orthopedic surgeons or residents under direct supervision. Another previous study showed no difference in dislocation frequency between the posterior and lateral approaches.[39] Although inadequate restoration of femoral offset and leg length may be associated with a higher frequency of dislocation,[36,40,41] we did not have enough radiographs of sufficient uniformity of technique or quality to evaluate these parameters.

The low frequency of reoperation for acetabular wear observed (28 hips in 4693 patients [0.60%]) is consistent with previous reports on monoblock unipolar and bipolar hemiarthroplasties and cemented or uncemented stems.[15,42,43] Reoperation for acetabular wear in the present study was associated with absence of dementia, possibly because of the greater activity level typical in these patients.[44] Unipolar hemiarthroplasty is associated with greater acetabular wear and lower health-related quality of life than bipolar hemiarthroplasty within 2 years after initial surgery.[45]

The frequency of infection in the present study was lower (26 hips in 4693 patients [0.55%]) than reported previously after hemiarthroplasty for femoral neck fracture (1.7%–7.3%),[46,47] possibly because our data captured only deep infections that necessitated surgical treatment and not superficial or low-grade infections that were treated nonoperatively. The risk of developing

an infection after hemiarthroplasty may be associated with female sex, body mass index greater than 30 kg/m^2, glucocorticoid and immunosuppressive drug treatment, previous same-site surgery, concurrent cutaneous, urinary, or abdominal infections,[48] chronic residence in a health care institution,[49] surgeon experience,[50–52] duration of anesthesia,[50] operating time,[51] mode of wound closure,[53] prolonged wound drainage for more than 10 days, deep palpable hematoma, inadequate antibiotic prophylaxis, and postoperative dislocation.[48] However, patient age, sex, body mass index, use of uncemented fixation, presence of diabetes, smoking, and inflammatory arthritis were not associated with an increase in the risk of failure by infection versus other modes of hemiarthroplasty failure in our study (data not shown). Although seizures have been associated with the development of bilateral femoral neck fractures,[54] literature search showed no previous association between seizure disorder and the risk of developing an infection after hemiarthroplasty for femoral neck fracture. As aseptic loosening was an infrequent cause of hemiarthroplasty failure leading to revision, we were unable to identify any clinical factors associated with the development of aseptic loosening compared with other causes of failure.

Limitations

Limitations of the present study include those inherent with a retrospective study based on billing data and paper medical records. We did not evaluate total hip arthroplasty as treatment for femoral neck fracture or compare hemiarthroplasty with total hip arthroplasty because total hip arthroplasty was performed less frequently for fracture treatment than hemiarthroplasty in Manitoba during the study period and less frequently for fracture treatment than in Ontario.[10,55] In another Canadian study from Alberta, hemiarthroplasty and total hip arthroplasty were combined and not analyzed separately because of potential miscoding of hemiarthroplasty as a total hip arthroplasty, and the frequency of miscoded operations in our study is unknown.[56] In addition, we did not evaluate the delay in performing hemiarthroplasty after the acute fracture, which may increase the risk of developing a dislocation and mortality, because the date of fracture frequently was missing.[57,58] Furthermore, some variables regarding postoperative care that could have affected outcomes, such as home care or treatment in a rehabilitation centre,[59] were not evaluated, and functional assessment of patients was beyond the scope of our study.[60] Nevertheless, the present results may be useful as benchmark information for future analyses and quality-improvement efforts focused on femoral neck fractures in an aging population.[61]

Conclusion

Hemiarthroplasty for femoral neck fracture has a low frequency of failure, but failure may be associated with substantial morbidity. Despite differences in implant use and fixation techniques, our findings were comparable to those of other studies and registry data globally. Most failures were due to periprosthetic femur fracture, dislocation, acetabular wear and infection.

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