

Operative outcome of Hong Kong centenarians with hip fracture

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ABSTRACT

Introduction: International clinical guidelines recommend early surgical treatment for geriatric patients with hip fracture. There are, however, few data concerning the operative outcome of centenarians. This study aimed to report the epidemiology of hip fracture and postoperative mortality rate, and to discuss whether operation is justified in centenarians in Hong Kong.

Methods: This observational study was carried out in all public hospitals of Hong Kong. All patients aged 100 years or above who underwent hip fracture surgery in any public hospital between 1 January 2010 and 31 December 2013 were included. Their postoperative mean and median survival time was recorded.

Results: Of 114 centenarians, 96 (84%) were female. The age of patients ranged from 100 to 109 years, with the largest number (44%) aged 100 years. The follow-up interval ranged from 5 to 1619 days (median, 412 days; interquartile range, 683 days). The 1-month, 6-month, and 1-year mortalities were 8%, 25%, and 37%, respectively. By Kaplan-Meier analysis, the postoperative mean survival was 2 years 2 months (95% confidence interval, 680-936

days) and the median survival time was 2 years (interquartile range, 1234 days).

Conclusion: The 1-year mortality among Hong Kong centenarians with hip fracture was 37%, which is lower than the 41.1% in the general centenarian population in Japan. The median survival time after hip fracture surgery was 2 years, suggesting that surgery even at an extreme age is worthwhile to maintain quality of life. Extreme age should not be a barrier to operative treatment.

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New knowledge added by this study

- The postoperative 1-year mortality among Hong Kong centenarians with hip fracture was comparable to that of the general centenarian population in Japan.
- The median postoperative survival time of the centenarians in this study was 2 years.

Implications for clinical practice or policy

- Operative treatment should be offered to centenarians with hip fracture to maintain their quality of life. Extreme age should not be a barrier to hip fracture surgery.

Introduction

Fragility fracture is one of the common chronic diseases in geriatrics. The prevalence of femoral neck osteoporosis based on a hip T-score of < -2.5 was 47.8% in males and 59.1% in females in our previous study of 239 hip fractures.¹ The incidence of hip fracture increases with age, and the incidence is high in the elderly (1639 per 100 000 in men and 3012 per 100 000 in women for the age-group of ≥ 85 years).^{2,3} A 2015 study of geriatric hip fracture showed that there was a steady increase in the incidence of geriatric hip fracture in Hong Kong.⁴ The overall 30-day and 1-year mortalities were 3.01% and 18.56%, respectively. Advancing age and male sex were associated with an increased mortality and a higher excess mortality rate following surgery.⁴

With the advances in medical technology, the population of centenarians is increasing both locally and internationally. In Hong Kong, the number of centenarians has increased 6.5-fold over the last 30 years, from 289 in 1981 to 1890 in 2011 (about 3/10 000).⁵ Hong Kong women have overtaken Japanese women for longevity, with an average life expectancy reaching 87.32 years in 2015 compared with 87.02 years in Japan, according to statistics from Japan's Ministry of Health, Labour and Welfare.⁶ Advanced medical service and easy access to emergency services may contribute to this longevity. International clinical guidelines recommend early surgical treatment for geriatric patients with hip fracture once their medical condition has been optimised with the help of a geriatrician.⁷ There

香港百歲以上長者進行髖關節骨折手術後的結果

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引言：國際臨床指引建議應盡早為老年髖關節骨折患者施行手術。然而，有關百歲以上長者手術結果的數據寥寥可數。本研究旨在報告百歲以上髖關節骨折長者的流行病學和術後死亡率，從而討論應否為這群組進行有關手術。

方法：這觀察研究於香港公立醫院進行。所有在2010年1月1日至2013年12月31日期間患有髖關節骨折的百歲以上長者均被列入研究範圍。研究有關病人術後的平均存活期及其中位數。

結果：共114位百歲或以上長者被納入研究範圍，當中96位（84%）為女性。病人年齡介乎100至109歲，當中100歲的長者佔44%。隨訪期由5日至1619日不等（中位數412日；四分位距683日）。病人術後的1個月、6個月及1年死亡率分別為8%、25%及37%。Kaplan-Meier存活曲線分析結果顯示術後生存率平均為兩年零兩個月（95%置信區間：680至936日），中位數為兩年（四分位距：1234日）。

結論：香港百歲以上髖關節骨折長者的術後一年死亡率為37%，與日本一般百歲以上長者的死亡率（41.1%）相若。此外，他們術後平均壽命為兩年，由此可見，為他們進行髖關節骨折手術以改善生活質素是值得的。年齡不應成為老年患者的手術障礙。

are, however, few data concerning the operative outcome of this group of oldest elderly. Although centenarians represent only a small subset of the elderly population, their number is expected to further increase.⁵ Therefore it is important for us to understand the surgical outcome for this particular group of patients to enable provision of the best care and effective use of limited health care resources. The aims of our study were to report the epidemiology of hip fracture and postoperative mortality rate, and to discuss whether surgery is justified in this group of patients.

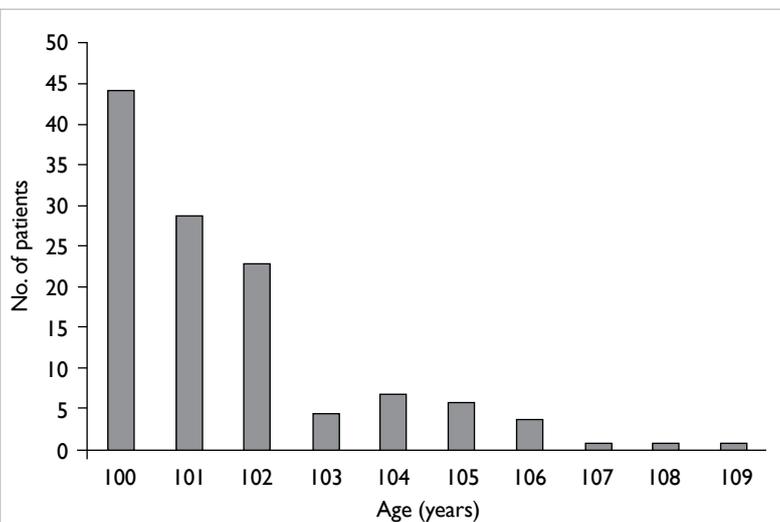


FIG 1. Age distribution of centenarian hip fracture patients

Methods

This was an observational study of all patients aged 100 years or above who underwent hip fracture surgery in any public hospital in Hong Kong between 1 January 2010 and 31 December 2013. This study was done in accordance with the principles outlined in the Declaration of Helsinki. Data were retrieved from the Hospital Authority clinical database that included 99% of geriatric patients with hip fracture in Hong Kong.^{8,9} Patients with hip fracture aged 100 years or above were extracted from the Clinical Data Analysis and Reporting System using International Classification of Diseases code 820 under subdivision Operation Theatre Management System-linked diagnosis. Complications of initial hip surgery or periprosthetic fractures were excluded. Demographics, type of operation, and dates of admission, discharge, and death were retrieved. Mortality of the general population was retrieved using census data and the death registry of Hong Kong Special Administrative Region.

Data are shown as mean and 95% confidence interval, or median and interquartile range. Mortality and survival were calculated using Kaplan-Meier survival analysis. Analyses were performed using the Statistical Package for the Social Sciences (Windows version 16.0; SPSS Inc, Chicago [IL], US). Comparative tests between different groups were performed using Chi squared test. A P value of <0.05 was considered statistically significant.

Results

During the 4-year study period, 114 centenarians underwent surgery in Hong Kong for primary hip fracture, of whom 96 (84%) were female. The age of patients ranged from 100 to 109 years, with the largest number (44%) aged 100 years (Fig 1). The largest number of patients were admitted to hospitals in Kowloon West Cluster, and this accounted for 25%. Most were residents in the Eastern district (12%) and Sham Shui Po (11%) before admission. Overall, 62 (54%) patients were admitted from elderly care homes. Hip fracture surgery was performed as an emergency in 76 (67%) patients. Closed reduction and internal fixation of the femur was performed in 80 (70%) patients, partial hip replacement in 28 (25%), and other hip surgery in six (5%). Postoperative admission to an intensive care unit (ICU) or high dependency unit (HDU) was necessary in two patients. The mean length of stay in an acute ward was 13.3 days, with a median of 10.5 days.

Postoperative follow-up ranged from 5 to 1619 days (median, 412 days; interquartile range, 683 days). The 1-month, 6-month, and 1-year mortality rates were 8%, 25%, and 37%, respectively (Table 1). By Kaplan-Meier analysis, the postoperative mean survival was 2 years 2 months (95% confidence

interval, 680-936 days) and the median survival time was 2 years (interquartile range, 1234 days) [Fig 2].

Discussion

With an increase in life expectancy, the health care authority is likely to encounter more elderly patients with hip fracture. The cost of providing clinical care for centenarians imposes a substantial financial burden on our health care system. There are only a few publications that specifically examine the surgical outcome of centenarians following hip fracture surgery. Due to their limited sample size, these studies have failed to justify the need to operate on centenarians with hip fracture. A previous report by Tarity et al¹⁰ on 23 centenarians reported a 1-year mortality of 60% and concluded that operating on patients >100 years carried an acceptable mortality rate. Patil et al¹¹ reported a high mobility rate of 77% and a low mortality rate of 8.3% in 13 centenarians, and concluded that hip fracture surgery yielded a good return on money spent and quality of life. Shabat et al¹² reported a mortality rate of 48% in 23 centenarians and concluded that operated cases had shorter hospitalisation and patients with two or more co-morbid diseases had a higher mortality rate. Only one prospective review has reported the surgical outcome of patients aged ≥95 years with the largest sample size of 50 patients.¹³ They reported a mortality rate of 36% that was higher than that of a younger age-group. Predictors of mortality included the American Society of Anesthesiologists physical status classification system, number of co-morbidities, and active medical problems. Despite numerous studies in different parts of the world, there are no data for Asian patients.

In our study, the postoperative 1-year mortality rate for centenarians with hip fracture was 37%. The postoperative mortality rate of centenarians was higher than that of hip fracture patients aged >65 years.⁴ The mortality rate in this study was similar to that of the abovementioned studies. Nonetheless, Hong Kong is one of the countries/regions with the longest life expectancy, and we had the largest sample size of 114 patients compared with previous studies (Table 2¹⁰⁻¹³).

Although two centenarians required ICU or HDU admission during their hospital stay, the postoperative 1-year mortality of 37% in our study is lower than the 41.1% for a general centenarian population in Japan ($P < 0.05$).¹⁴ Those patients in our study also had a reasonable median postoperative survival of 2 years.

Previous studies have shown that the benefits of surgery are not confined to improving mobility, it also reduces other related complications, improves patient care, and is more cost-effective than other non-surgical treatments.¹⁵⁻¹⁷ Early multidisciplinary geriatric care also reduces in-hospital mortality

TABLE 1. Mortality at different time points for centenarians who underwent surgery for hip fracture

	Duration		
	1 Month	6 Months	1 Year
Male	0%	16.7%	44.4%
Female	9.4%	26.0%	35.4%
Total	8%	25%	37%

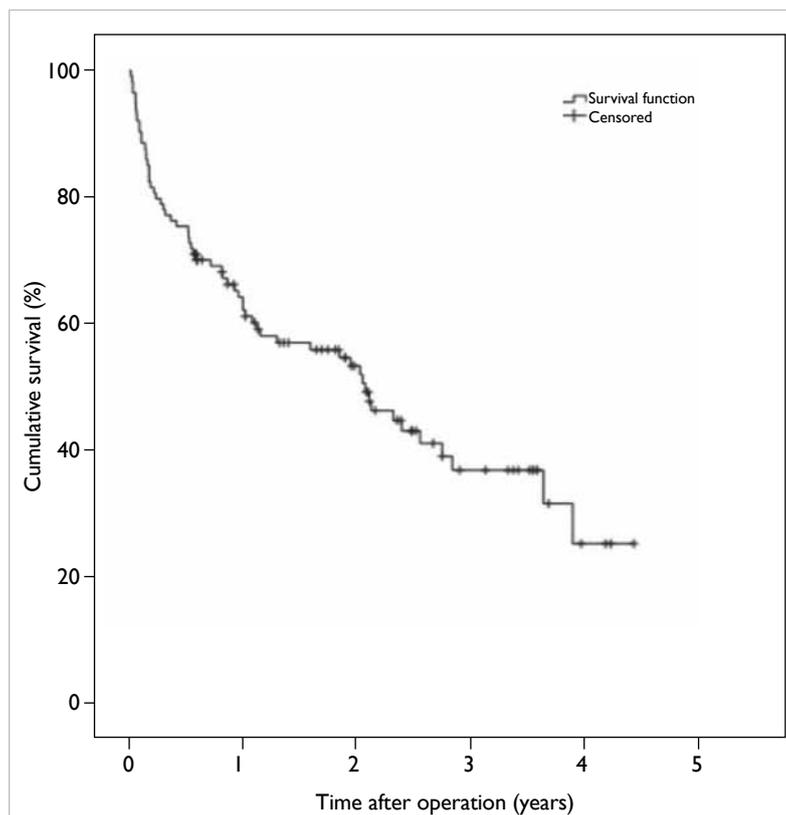


FIG 2. Kaplan-Meier survival curve of postoperative survival in centenarian hip fracture patients

The postoperative mean and median survival time was 2 years 2 months and 2 years, respectively (95% confidence interval, 680-936 days and 519-994 days, respectively)

and medical complications.¹⁸ Patients who have undergone hip fracture surgery can be transferred from an acute unit to rehabilitation as soon as they are medically stable. In this study, the mean length of stay on an acute ward was 13.3 days. Weight-bearing walking exercises can be initiated immediately after surgery so minimising complications related to being bedbound. This will also lower the inevitable costs of acute hospital care. Some of the centenarians in our study were able to walk independently with aid following rehabilitation. One of the most encouraging cases was a 104-year-old woman who underwent dynamic hip screw fixation surgery with subsequent cut-out and converted to cemented unipolar hemiarthroplasty 1 month after the initial operation. She was able to walk well with a frame after 2 weeks of rehabilitation and was finally

TABLE 2. Comparison of different studies concerning the surgical outcome for centenarians who underwent surgery for hip fracture

	Shabat et al, ¹² 2004	Holt et al, ¹³ 2006	Patil et al, ¹¹ 2012	Tarity et al, ¹⁰ 2013	Present study, 2017
Study nature	Retrospective	Prospective	Retrospective	Retrospective	Observation
Patient age (years)	≥100	≥95	≥100	≥100	≥100
Country/ethnics	Israel	UK	US	US	Hong Kong SAR, China
No. of patients	23	50	13	23	114
1-Year mortality	48%	36%	8.3%	60%	37%
Conclusion	Operated cases had shorter hospitalisation; ≥2 co-morbidities had higher mortality	Predictors of mortality included the ASA grade, number of co-morbidities, and active medical problems	Surgery yielded a good return on money spent and quality of life	Operating on patients >100 years carried an acceptable mortality rate	Median survival was 2 years after operation. Extreme age should not be a barrier to hip fracture operation

Abbreviation: ASA = American Society of Anesthesiologists

discharged home.

A limitation of our study was its observational nature rather than being a prospective randomised controlled trial. It would be unethical, however, to randomise patients to have surgery or not and the sample size would be too small to provide enough statistical power to demonstrate any significant difference for this extreme of age. To the best of our knowledge, our sample size of 114 makes it the largest study to date of the surgical outcome of centenarians undergoing hip fracture surgery (Table 2). The present study undoubtedly provides insight into the treatment of centenarians with hip fracture and should prompt further research on this topic.

Conclusion

The postoperative 1-year mortality rate among Hong Kong centenarians with hip fracture was 37%, lower than the 41.1% in the general centenarian population of Japan. Centenarians also had a reasonable median survival of 2 years after hip fracture surgery. The mean length of stay in an acute ward was only 13.3 days. Therefore, surgery for hip fracture, even at extreme age, is worthwhile to maintain quality of life for affected patients. Extreme age should not be a barrier to operative treatment.

Declaration

All authors have disclosed no conflicts of interest.

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