



# Treatment of Femoral Neck Fractures in the Elderly: A Survey of the Korean Hip Society Surgeons

Hong Seok Kim, MD, PhD, Je-Hyun Yoo, MD, PhD\*, Young-Kyun Lee, MD, PhD<sup>†</sup>,  
Jong-Seok Park, MD, PhD<sup>†</sup>, Ye-Yeon Won, MD, PhD<sup>‡</sup>

*Department of Orthopaedic Surgery, Seoul National University Hospital, Seoul, Korea*

*Department of Orthopaedic Surgery, Hallym University Sacred Heart Hospital, Anyang, Korea\**

*Department of Orthopaedic Surgery, Seoul National University Bundang Hospital, Seongnam, Korea<sup>†</sup>*

*Department of Orthopedic Surgery, Soonchunhyang University Hospital Cheonan, Cheonan, Korea<sup>‡</sup>*

*Department of Orthopaedic Surgery, Ajou University Medical Center,*

*Ajou University College of Medicine, Suwon, Korea<sup>§</sup>*

**Purpose:** This study examined the methods for treatment of femoral neck fracture (FNF) preferred by members of the Korean Hip Society (KHS) and identified factors that influence decisions regarding the surgical intervention of choice.

**Materials and Methods:** A total of 97 members of the KHS responded to the 16-question survey which included questions about the mean number of surgeries performed each month for treatment of femoral neck fractures, the cut-off age for deciding between internal fixation and arthroplasty, the implant used most often, usage of cement, and factors influencing each decision.

**Results:** The mean cut-off age used when deciding between internal fixation and arthroplasty was 64 years old. Hemiarthroplasty (HA) (70%) was the most preferred option for treatment of displaced FNFs in cases where arthroplasty was indicated (total hip arthroplasty [THA] 19% and dual mobility THA 11%). The main reasons for selection of arthroplasty over reduction with internal fixation were age and pre-fracture ambulatory status. Pre-trauma ambulatory status and/or sports activity were the main factors in selection of HA over THA. Cement was used by 33% of responders. Poor bone quality and a broad femoral canal were factors that influenced the usage of cement.

**Conclusion:** Management of FNFs in the elderly is a major health problem worldwide; thus, remaining alert to current trends in treatment is essential for surgeons. The mean cut-off age used in deciding between internal fixation and arthroplasty was 64 years old. HA is the preferred method for treatment of displaced FNFs for members of the KHS.

**Key Words:** Survey, Femoral neck fractures, Aged, Arthroplasty, Fracture fixation

**Submitted:** December 26, 2022 **1st revision:** January 31, 2023

**Final acceptance:** February 1, 2023

**Address reprint request to**

**Jong-Seok Park, MD, PhD**

(<https://orcid.org/0000-0002-0225-0500>)

Department of Orthopedic Surgery, Soonchunhyang University Hospital Cheonan, 31 Suncheonhyang 6-gil, Dongnam-gu, Cheonan 31151, Korea

**TEL:** +82-41-570-2176

**E-mail:** [jsparksch@schmc.ac.kr](mailto:jsparksch@schmc.ac.kr)

Hong Seok Kim and Je-Hyun Yoo contributed equally to this study as co-first authors.

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## INTRODUCTION

Femoral neck fracture is a major public health issue associated with bone quality, functional recovery, and population statistics<sup>1)</sup>. As a consequence of a super-aged society, the incidence of hip fractures is expected to show a substantial increase. Hip surgery is required for treatment of most hip fractures, which could also lead to impaired mobility, complications, and even death<sup>2)</sup>.

Therefore, patients with hip fracture should receive appropriate treatment in order to minimize any socioeconomic impact. However, there is still no universal consensus regarding treatment of femoral neck fractures. Reduction and internal fixation is regarded as the most effective treatment for undisplaced femoral neck fractures<sup>3)</sup>. There is debate with regard to the optimal surgical treatment for displaced femoral neck fractures<sup>4-6)</sup>.

The purpose of this study was to examine the methods for treatment of femoral neck fracture preferred by members of the Korean Hip Society (KHS) and to identify factors that

influence decisions regarding the surgical intervention of choice.

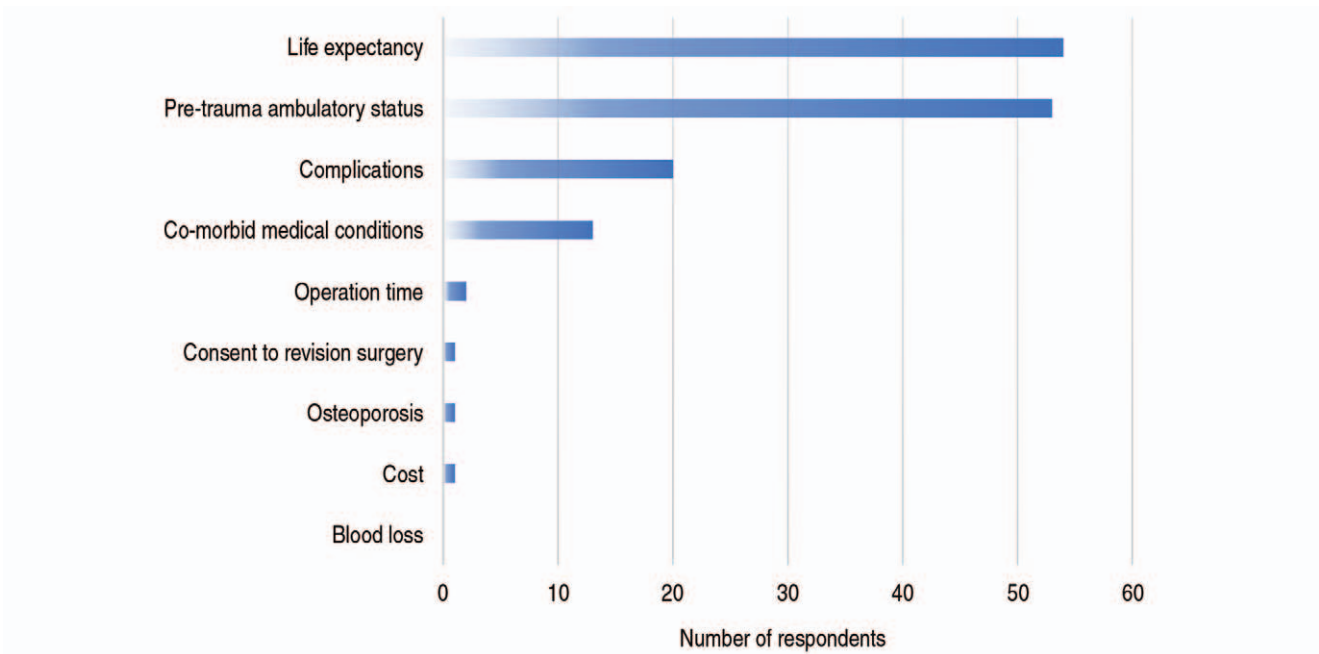
## MATERIALS AND METHODS

Data collection was performed using a six-question survey of basic demographics and backgrounds and a 10-question survey that categorized the preferred method of treatment and the factors influencing this decision (Supplementary Material 1). The questionnaires were distributed to members of the KHS from July 1, 2022, to August 2, 2022. A message containing the survey hyperlink was mailed to all members of the KHS. The results of the survey were anonymous and were collected on the web. As shown in Table 1, the questionnaire included the following: basic demographics of respondents including age, practice environment, duration of orthopedic practices, involvement in resident education, the mean monthly number of proximal femoral fractures, femoral neck fractures, and displaced femoral neck fractures, the cut-off age used for deciding between inter-

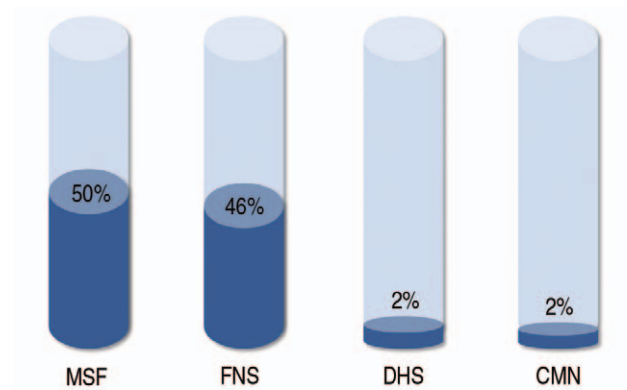
**Table 1.** Demographics of Respondents (n=97)

Parameter	Value
Age (yr)	52.7±15.4
31-40	23 (23.7)
41-50	39 (40.2)
51-60	23 (23.7)
>61	12 (12.4)
Practice environment	
Clinic (<30 beds)	1 (1.0)
Hospital (30-99 beds)	4 (4.1)
General hospital (100-500 beds)	20 (20.6)
University- or tertiary-hospital (>500 beds)	72 (74.2)
Career in orthopedic surgery (yr)	15.3±9.8
Involvement in resident training	84 (86.6)
Attendance of the Korean Hip Society Practice guideline symposium in the last 3 years	77 (79.4)
The mean monthly number of hip fracture surgery	
<5 cases	7 (7.2)
5-10 cases	12 (12.4)
11-20 cases	40 (41.2)
>20 cases	38 (39.2)
The mean monthly number of femoral neck fractures	
<5 cases	30 (30.9)
5-20 cases	66 (68.0)
>20 cases	1 (1.0)
The mean proportion of displaced femoral neck fractures	
<25%	5 (5.2)
25-49%	11 (11.3)
50-74%	45 (46.4)
>75%	36 (37.1)

Values are presented as mean±standard deviation or number (%).



**Fig. 1.** The factors that had the greatest influence on the decision regarding the cut-off age used in deciding between internal fixation and arthroplasty.



**Fig. 2.** The preferred device for use in performance of internal fixation in young patients with displaced femoral neck fractures.

MSF: multiple screw fixation, FNS: Femoral Neck System (Depuy Synthes), DHS: dynamic hip screw, CMN: cephalomedullary nail.

nal fixation and arthroplasty, the implant used most often, usage of cement, and factors influencing each decision. Regarding the factors, the respondents were asked to indicate the two most important factors.

IBM SPSS Statistics for Windows (ver. 26.0; IBM) was used for performance of any statistical analysis.

**RESULTS**

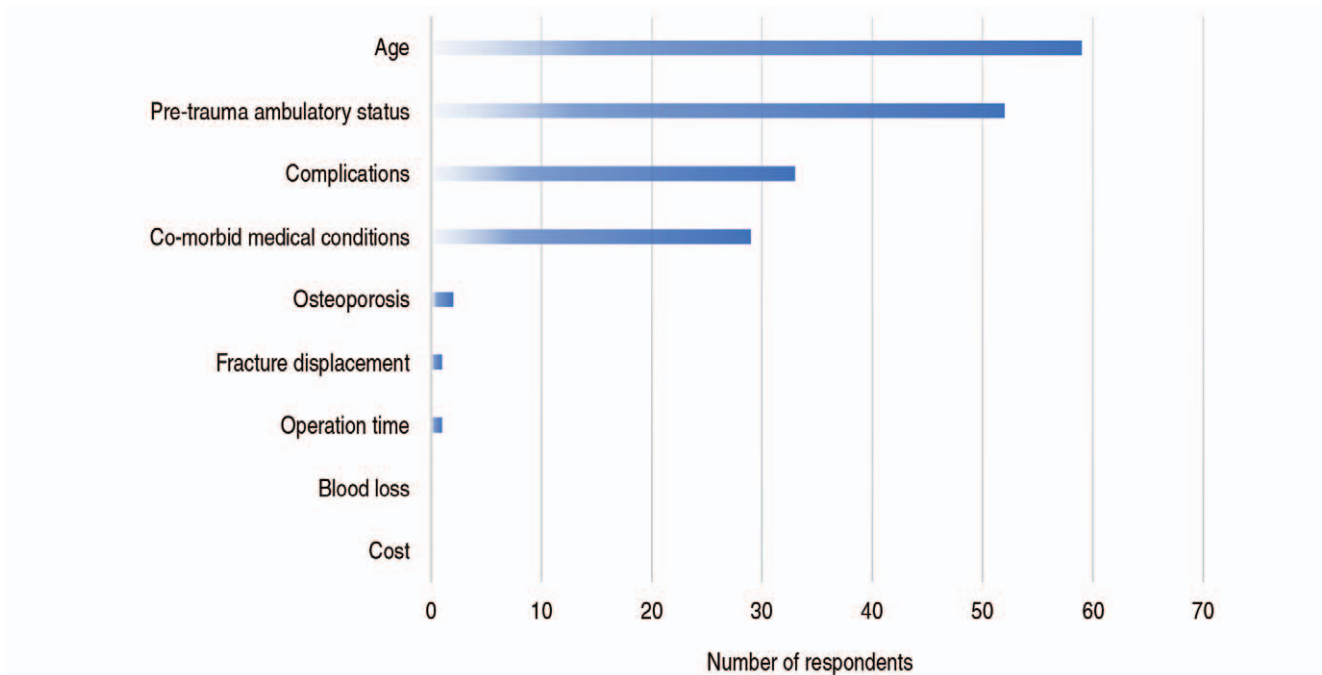
The survey was mailed to all 570 KHS members, and 97 members responded for a survey response rate of 17%. Basic demographics are shown in Table 1.

The mean cut-off age for deciding between internal fixation and arthroplasty was  $63.6 \pm 7.6$  years old. Life expectancy and pre-trauma ambulatory status were ranked as the two most important factors by a large number of respondents, 54 and 53, respectively, while cost and blood loss were ranked as the least (Fig. 1).

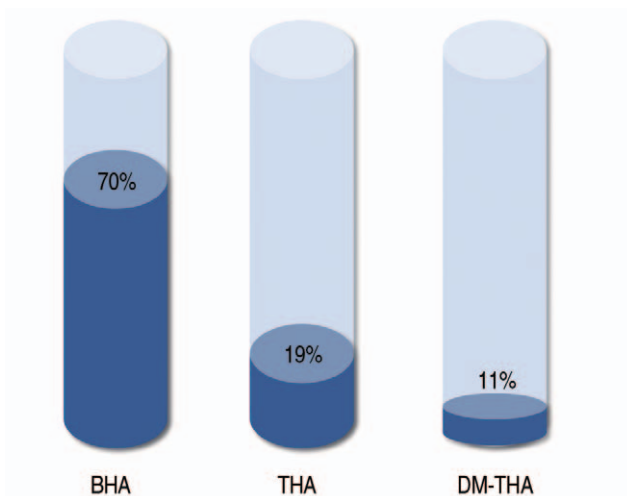
In cases where internal fixation was planned for patients younger than the cut-off age, multiple screw fixation and Femoral Neck System (FNS; Depuy Synthes) were the devices utilized most often, as indicated by 50% and 46% of respondents, respectively (Fig. 2).

Of 97 surgeons, 59 surgeons selected ‘age’ as the reason for performance of arthroplasty rather than internal fixation in treatment of displaced femoral neck fractures in elderly patients. The pre-trauma ambulatory status was selected as the second most important factor (52 of 97) (Fig. 3).

Bipolar hemiarthroplasty was selected as the most commonly performed arthroplasty procedure by 70% (68/97) of respondents (Fig. 4). The pre-trauma ambulatory status followed by age were the most important factors influencing the decision to perform hemiarthroplasty over total hip arthroplasty for patients with displaced femoral neck frac-



**Fig. 3.** The factors that have the greatest influence on the decision not to perform internal fixation surgery in older patients with displaced femoral neck fractures.



**Fig. 4.** The procedure of choice in cases where arthroplasty was planned in older patients with displaced femoral neck fractures.

BHA: bipolar hemiarthroplasty, THA: total hip arthroplasty, DM-THA: dual mobility total hip arthroplasty.

ture who were older than the cut-off age (Fig. 5).

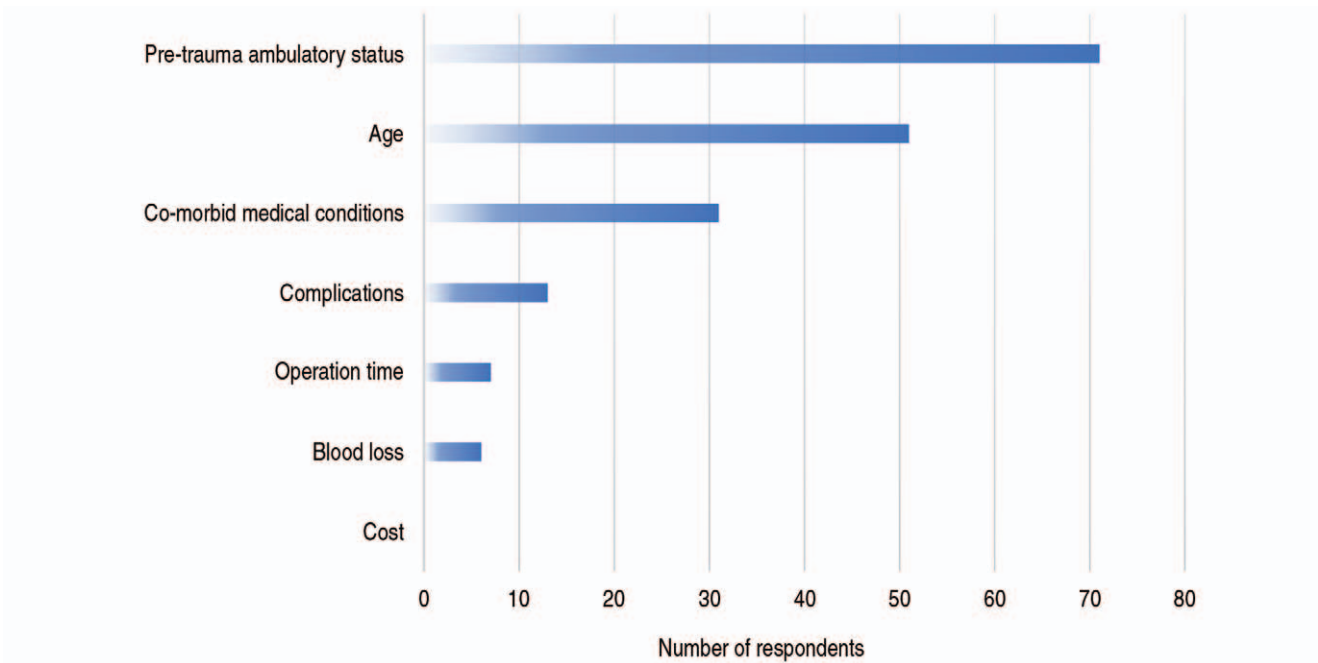
Cemented arthroplasty was not used by 66% (64/97) of respondents. No statistical difference in age distribution was observed between surgeons who used cement and those who did not. Among surgeons who responded as a cement-user, poor bone quality was selected as the most important

reason by 44%, and the broad femoral canal was selected by 33% (Fig. 6).

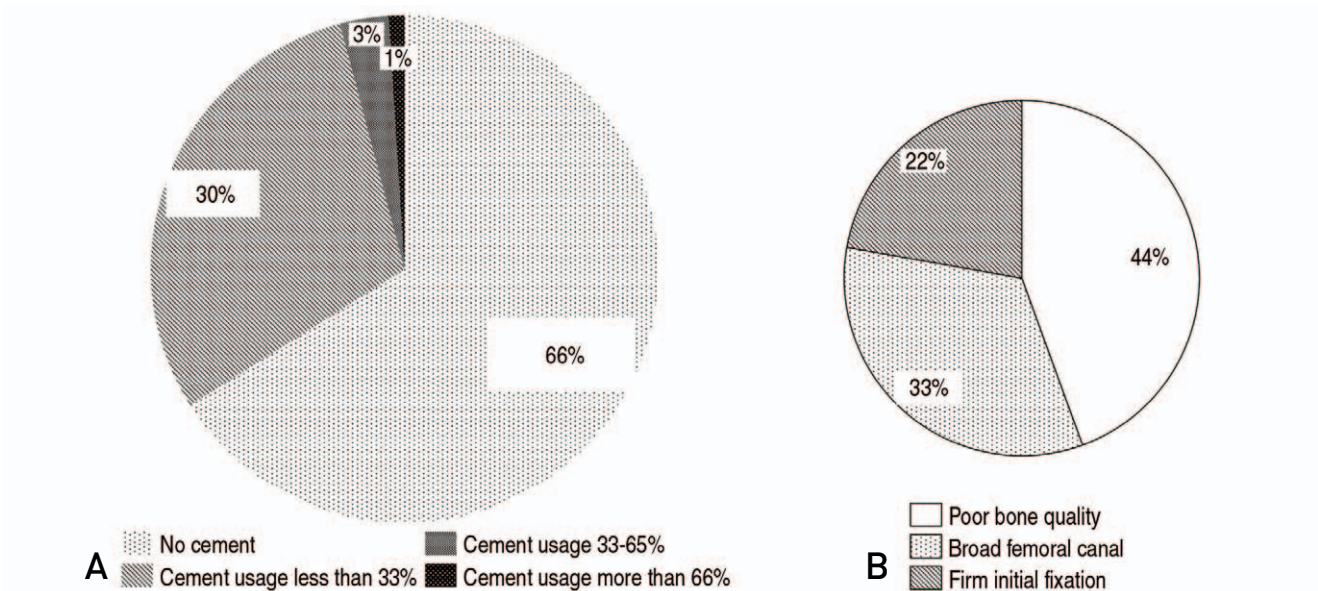
### DISCUSSION

Of 97 respondents, 66 respondents reported that they encountered 5-20 cases of femoral neck fracture monthly. A cut-off age of ‘65 years old’ for deciding between internal fixation and arthroplasty for treatment of displaced femoral neck fractures was selected by 51 members (52.6%). In cases where internal fixation was planned, the results indicated equally wide use of multiple screw fixation and FNS. Hemiarthroplasty was the procedure of choice in treatment of displaced femoral neck fractures. Cost and blood loss did not appear to be of importance in the decision-making process.

There is no consensus regarding the cut-off age for deciding between internal fixation and arthroplasty in treatment of displaced femoral neck fractures. Internal fixation is the most widely utilized approach in treatment of patients >65 years old with a nondisplaced fracture; in patients with a displaced fracture, internal fixation is often reserved for patients <60 years old<sup>3,7)</sup>. These findings are comparable to the results of our survey, which indicated that the mean cut-off age was approximately 64 years old. However, with the increasing population of active elderly people, age standards



**Fig. 5.** The factors that have the greatest influence on deciding between bipolar hemiarthroplasty and total hip arthroplasty in older patients with displaced femoral neck fractures.



**Fig. 6.** (A) The proportion of cement usage when arthroplasty was performed. (B) The reason for usage of cement.

would also be changing.

A change in preference for fixation devices was observed. Due to its superior biomechanical properties, a sliding hip screw was reported to yield superior outcomes when compared to multiple screw fixation<sup>6</sup>. However, along with the recent introduction of FNS to the market, almost half of the respondents answered that FNS was the device of choice for

use in performance of internal fixation. When making a smaller incision, FNS appeared to provide biomechanical properties similar to those of sliding hip screws<sup>8</sup>. However, owing to its intuitive and straightforward approach, multiple screw fixation was selected as the device of choice among KHS members.

Bipolar hemiarthroplasty was selected as the procedure

of choice in cases where arthroplasty was indicated. However, in a randomized controlled trial of 120 patients with a displaced fracture that compared the results of total hip arthroplasty with those of bipolar hemiarthroplasty, Hedbeck et al.<sup>9</sup> reported that better clinical and functional outcomes were obtained after four years with use of total hip arthroplasty. In contrast, similar international randomized controlled trials reported no differences in functional outcomes between the two surgeries after two years<sup>10</sup>. Conduct of registry-based research including large amounts of data is warranted for further investigation.

Early ambulation is mandatory for prevention of further complications such as pneumonia, deep vein thrombosis, and pulmonary embolism; thus, firm fixation of the femoral stem in patients with femoral neck fracture is critical. Inngul et al.<sup>11</sup> reported that use of cemented stems resulted in better function compared with cementless stems in cases where arthroplasty was selected due to age, lower functional demand, and/or poor bone quality. However, usage of cement in the femoral canal has shown an association with an increased risk of fat embolism and cardiopulmonary events<sup>12,13</sup>. Accordingly, 66% of respondents reported a preference for cementless stems. Although findings from several randomized controlled trials have indicated that there was no difference between cemented and cementless arthroplasty, cementless arthroplasty appeared to be favored as a result of development of modern coating technology in Korea.

In cases where arthroplasty was planned, dislocation was a major concern and a complication rate of 3.8% was reported for hemiarthroplasty and 10% for total hip arthroplasty<sup>14</sup>. With the introduction of dual mobility total hip arthroplasty, many surgeons expected and reported clinical outcomes with lower rates of dislocation<sup>15</sup>. According to the results of our survey, only a few respondents reported using dual mobility total hip arthroplasty. The popularity of dual mobility implants would be expected to increase along with accumulation of clinical results including complication rates.

Conduct of further study based on the results of this study will be required. Trends in treatment of femoral neck fracture as well the timing of surgery, peri-operative blood management, postoperative functional recovery protocol, etc. have shown continual change. Unfortunately, the questionnaire developed in this study focused primarily on the treatment modality for femoral neck fracture; however, the same degree of importance could be ascribed to the previously mentioned factors and protocols. In an effort to attain a comprehensive understanding of the management of femoral neck fractures, we suggest that future surveys include a broad-

er range of subjects.

This study had two major limitations. The survey included a small number of clinicians, and our results might not represent the general view of orthopedic surgeons in Korea. In addition, performance of a thorough analysis is difficult when conducting a survey-based study, therefore, the reasons and underlying rationale for each decision might be more varied.

## CONCLUSION

Management of femoral neck fractures in the elderly is a major public health problem worldwide, and surgeons should remain alert to current trends in treatment. For members of the KHS, the cut-off age for choosing between internal fixation and arthroplasty was 64 years old, and bipolar hemiarthroplasty was the procedure performed most often. However, implementation of a personalized approach to treatment of each fracture is needed.

## FUNDING

No funding to declare.

## ACKNOWLEDGEMENTS

This study was presented at the Fracture Symposium of the Korean Hip Society in November 2022.

## CONFLICT OF INTEREST

Young-Kyun Lee has been an editorial board member since January 2023, but had no role in the decision to publish this article. No other potential conflict of interest relevant to this article was reported.

## ORCID

Hong Seok Kim (<https://orcid.org/0000-0002-9524-7019>)  
Je-Hyun Yoo (<https://orcid.org/0000-0002-0777-1575>)  
Young-Kyun Lee (<https://orcid.org/0000-0001-6564-4294>)  
Jong-Seok Park (<https://orcid.org/0000-0002-0225-0500>)  
Ye-Yeon Won (<https://orcid.org/0000-0002-1880-4336>)

## SUPPLEMENTARY MATERIALS

Supplementary data is available at <https://hipandpelvis.or.kr/>.

## REFERENCES

1. Mann E, Meyer G, Haastert B, Icks A. *Comparison of hip fracture incidence and trends between Germany and Austria 1995-2004: an epidemiological study. BMC Public Health. 2010;10:46. <https://doi.org/10.1186/1471-2458-10-46>*
2. Veronese N, Maggi S. *Epidemiology and social costs of hip fracture. Injury. 2018;49:1458-60. <https://doi.org/10.1016/j.injury.2018.04.015>*
3. Dolatowski FC, Frihagen F, Bartels S, et al. *Screw fixation versus hemiarthroplasty for nondisplaced femoral neck fractures in elderly patients: a multicenter randomized controlled trial. J Bone Joint Surg Am. 2019;101:136-44. <https://doi.org/10.2106/JBJS.18.00316>*
4. Jo S, Lee SH, Yoon SJ. *Clinical outcomes of total hip arthroplasty for displaced femoral neck fractures in patients 80 years of age and older selected by clinical frailty score. Hip Pelvis. 2020;32:148-55. <https://doi.org/10.5371/hp.2020.32.3.148>*
5. Ekhtiari S, Gormley J, Axelrod DE, Devji T, Bhandari M, Guyatt GH. *Total hip arthroplasty versus hemiarthroplasty for displaced femoral neck fracture: a systematic review and meta-analysis of randomized controlled trials. J Bone Joint Surg Am. 2020;102:1638-45. <https://doi.org/10.2106/JBJS.20.00226>*
6. Fixation using Alternative Implants for the Treatment of Hip fractures (FAITH) Investigators. *Fracture fixation in the operative management of hip fractures (FAITH): an international, multicentre, randomised controlled trial. Lancet. 2017;389:1519-27. [https://doi.org/10.1016/S0140-6736\(17\)30066-1](https://doi.org/10.1016/S0140-6736(17)30066-1)*
7. Bhandari M, Devereaux PJ, Tornetta P 3rd, et al. *Operative management of displaced femoral neck fractures in elderly patients. An international survey. J Bone Joint Surg Am. 2005;87:2122-30. <https://doi.org/10.2106/JBJS.E.00535>*
8. Schuetze K, Burkhardt J, Pankratz C, et al. *Is new always better: comparison of the femoral neck system and the dynamic hip screw in the treatment of femoral neck fractures. Arch Orthop Trauma Surg. Published online July 22, 2022; <https://doi.org/10.1007/s00402-022-04551-w>*
9. Hedbeck CJ, Enocson A, Lapidus G, et al. *Comparison of bipolar hemiarthroplasty with total hip arthroplasty for displaced femoral neck fractures: a concise four-year follow-up of a randomized trial. J Bone Joint Surg Am. 2011;93:445-50. <https://doi.org/10.2106/JBJS.J.00474>*
10. HEALTH Investigators; Bhandari M, Einhorn TA, et al. *Total hip arthroplasty or hemiarthroplasty for hip fracture. N Engl J Med. 2019;381:2199-208. <https://doi.org/10.1056/NEJMoa1906190>*
11. Inngul C, Blomfeldt R, Ponzer S, Enocson A. *Cemented versus uncemented arthroplasty in patients with a displaced fracture of the femoral neck: a randomised controlled trial. Bone Joint J. 2015;97-B:1475-80. <https://doi.org/10.1302/0301-620X.97B11.36248>*
12. Parvizi J, Holiday AD, Ereth MH, Lewallen DG. *The Frank Stinchfield Award. Sudden death during primary hip arthroplasty. Clin Orthop Relat Res. 1999;(369):39-48. <https://doi.org/10.1097/00003086-199912000-00005>*
13. Olsen F, Kotyra M, Houltz E, Ricksten SE. *Bone cement implantation syndrome in cemented hemiarthroplasty for femoral neck fracture: incidence, risk factors, and effect on outcome. Br J Anaesth. 2014;113:800-6. <https://doi.org/10.1093/bja/aeu226>*
14. Pognard A, Bouhou M, Pidet O, Flouzatz-Lachaniette CH, Hernigou P. *High dislocation cumulative risk in THA versus hemiarthroplasty for fractures. Clin Orthop Relat Res. 2011;469:3148-53. <https://doi.org/10.1007/s11999-011-1987-7>*
15. De Martino I, D'Apolito R, Soranoglou VG, Poultsides LA, Sculco PK, Sculco TP. *Dislocation following total hip arthroplasty using dual mobility acetabular components: a systematic review. Bone Joint J. 2017;99-B(ASuppl1):18-24. <https://doi.org/10.1302/0301-620X.99B1.BJJ-2016-0398.R1> Erratum in: *Bone Joint J. 2017;99-B:702-4. <https://doi.org/10.1302/0301-620X.99B5.38086d>**