

World Journal of *Orthopedics*

World J Orthop 2023 August 18; 14(8): 589-661



MINIREVIEWS

- 589 Use of topical vancomycin powder in total joint arthroplasty: Why the current literature is inconsistent?
Mancino F, Yates PJ, Clark B, Jones CW
- 598 *In vitro* laboratory infection research in orthopaedics: Why, when, and how
Tsikopoulos K, Drago L, Meroni G, Kitridis D, Chalidis B, Papageorgiou F, Papaioannidou P
- 604 Fractures around the shoulder in the skeletally immature: A scoping review
Kraal T, Struijs PA, Langenberg LC, van Bergen CJA

ORIGINAL ARTICLE**Retrospective Cohort Study**

- 612 Failure rate, return-to-sports and magnetic resonance imaging after meniscal repair: 119 patients with 7 years mean follow up
Zicaro JP, Garrido N, Garcia-Mansilla I, Yacuzzi C, Costa-Paz M

Retrospective Study

- 621 Survival analysis in nonagenarian patients with non-hip lower limb fractures
Narayana Murthy S, Cheruvu MS, Siddiqui RS, Sharma N, Dass D, Ali A

META-ANALYSIS

- 630 Cemented *versus* uncemented stems for revision total hip replacement: A systematic review and meta-analysis
Elbardey H, Anazor F, Mirza M, Aly M, Maatough A

SCIENTOMETRICS

- 641 Scientific publications on orthopedic surgery from three major East Asian countries (2012-2021)
Chen WY, Xiao X, Pan C, Huang FH, Xu HY, Wei QJ, Jiang H

CASE REPORT

- 651 Metallosis with spinal implant loosening after spinal instrumentation: A case report
Kwan YH, Teo HLT, Dinesh SK, Loo WL

ABOUT COVER

Editorial Board Member of *World Journal of Orthopedics*, Giuseppe Solarino, MD, Professor, Department of Basic Medical Sciences, Neuroscience and Organs of Sense, School of Medicine, University of Bari "Aldo Moro", Bari 70121, Italy. giuseppe.solarino@uniba.it

AIMS AND SCOPE

The primary aim of *World Journal of Orthopedics* (WJO, *World J Orthop*) is to provide scholars and readers from various fields of orthopedics with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJO mainly publishes articles reporting research results and findings obtained in the field of orthopedics and covering a wide range of topics including arthroscopy, bone trauma, bone tumors, hand and foot surgery, joint surgery, orthopedic trauma, osteoarthropathy, osteoporosis, pediatric orthopedics, spinal diseases, spine surgery, and sports medicine.

INDEXING/ABSTRACTING

WJO is now abstracted and indexed in PubMed, PubMed Central, Emerging Sources Citation Index (Web of Science), Scopus, Reference Citation Analysis, China National Knowledge Infrastructure, China Science and Technology Journal Database, and Superstar Journals Database. The 2023 Edition of Journal Citation Reports® cites the 2022 impact factor (IF) for WJO as 1.9; IF without journal self cites: 1.9; 5-year IF: 2.2; Journal Citation Indicator: 0.64. The WJO's CiteScore for 2022 is 2.6 and Scopus CiteScore rank 2022: Orthopedics and sports medicine is 145/298.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: Zi-Hang Xu, Production Department Director: Xiang Li, Editorial Office Director: Jin-Lei Wang.

NAME OF JOURNAL

World Journal of Orthopedics

ISSN

ISSN 2218-5836 (online)

LAUNCH DATE

November 18, 2010

FREQUENCY

Monthly

EDITORS-IN-CHIEF

Massimiliano Leigheb, Xiao-Jian Ye

EDITORIAL BOARD MEMBERS

<http://www.wjgnet.com/2218-5836/editorialboard.htm>

PUBLICATION DATE

August 18, 2023

COPYRIGHT

© 2023 Baishideng Publishing Group Inc

PUBLISHING PARTNER

The Minimally Invasive Spine Surgery Research Center Of Shanghai Jiaotong University

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>

PUBLISHING PARTNER'S OFFICIAL WEBSITE

https://www.shtrhospital.com/zkjs/info_29.aspx?itemid=647



Retrospective Study

Survival analysis in nonagenarian patients with non-hip lower limb fractures

Sanjay Narayana Murthy, Manikandar Srinivas Cheruvu, Raheel Shakoor Siddiqui, Nikhil Sharma, Debashis Dass, Ashique Ali

Specialty type: Orthopedics

Provenance and peer review:

Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): B
Grade C (Good): 0
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Solarino G, Italy

Received: January 26, 2023

Peer-review started: January 26, 2023

First decision: April 28, 2023

Revised: May 30, 2023

Accepted: July 27, 2023

Article in press: July 27, 2023

Published online: August 18, 2023



Sanjay Narayana Murthy, Manikandar Srinivas Cheruvu, Nikhil Sharma, Debashis Dass, Ashique Ali, Department of Trauma and Orthopaedics, Royal Stoke University Hospital NHS Trust, Stoke-On-Trent ST4 6QG, United Kingdom

Raheel Shakoor Siddiqui, Department of General Surgery, Birmingham Heartlands Hospital, Birmingham B9 5SS, United Kingdom

Corresponding author: Sanjay Narayana Murthy, MBBS, Surgeon, Department of Trauma and Orthopaedics, Royal Stoke University Hospital NHS Trust, Newcastle Road, Stoke-On-Trent ST4 6QG, United Kingdom. sanjayn293@gmail.com

Abstract

BACKGROUND

The United Kingdom has an aging population with nearly 1 in 5 being over the age of 65, and over 0.5 million over the age of 90. The treatment of acute fractures of the lower limb in the nonagenarian cohort of patients poses a technical challenge to orthopaedic surgeons.

AIM

To report the fracture incidence, survival outcomes of treating acute non-hip lower limb fractures in nonagenarians in Major Trauma Centre.

METHODS

Thirty Lower limb long bone fractures in patients of age from 90 to 99 years were identified during 12-mo at a Level 1 trauma centre from a computerized database. A retrospective evaluation performed for fracture incidence, treatment, length of hospital duration and mortality at 30-d, 1-year and 2-year.

RESULTS

Thirty fractures (28 patients) were identified, twenty-four fractures were treated with surgery (mean age 93 years SD $\pm$ 2.59) and 6 managed conservatively (mean age 94 years SD $\pm$ 2.07). The mean length of the hospital stay was 18.2 d for both groups. The 30-d, 1-year and 2-year mortality risks were 1/23, 6/23 and 9/23 (4%, 26% and 39%) in the surgery group and 0/5, 1/5 and 2/5 (0%, 20% and 40%) in the conservative group, with no evidence for a difference between the two groups at any time point.

CONCLUSION

Nonagenarians in the surgical group had similar length of hospital stay and mortality risks as those treated conservatively. Patients with fewer comorbidities and admitted from their own home were offered surgery.

Key Words: Nonagenarian; Survival; Conservative; Non-hip; Fragility; Orthogeriatrics

©The Author(s) 2023. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: The treatment of acute lower limb fractures in nonagenarian population poses a technical challenge to orthopaedic surgeons, given the multiple co-morbidities, complex fracture pattern and poor bone quality. Nonagenarians account for 8% of all patients requiring acute fracture surgery. The main findings of this study are that surgery is more likely to be offered to those patients with fewer co-morbidities and those admitted from their own home, which indicates a higher functional status.

Citation: Narayana Murthy S, Cheruvu MS, Siddiqui RS, Sharma N, Dass D, Ali A. Survival analysis in nonagenarian patients with non-hip lower limb fractures. *World J Orthop* 2023; 14(8): 621-629

URL: <https://www.wjgnet.com/2218-5836/full/v14/i8/621.htm>

DOI: <https://dx.doi.org/10.5312/wjo.v14.i8.621>

INTRODUCTION

The treatment of fractures within the nonagenarian population (> 90 years)[1-2] poses a technical challenge to orthopaedic surgeons. This is because patients within this demographic often have multiple co-morbidities, poor bone quality and exhibit complex fracture patterns. 'Super-elderly' patients account for 8% of all patients requiring acute fracture surgery[2]. The World Health Organization has estimated that by 2050 the global population who are 65 years or more will be 1.5 billion and represent 16% of the world's population[2]. This will place an immense burden on the medical resources of the National Health Service for both the acute and rehabilitative care[3].

Much of the work pertaining to fractures in the elderly has centered on hip fractures[3]. There is sparse evidence in literature looking beyond the scope of hip fractures to other lower limb trauma within this patient population. It is unknown whether this group of patients share similar outcomes to those affected by hip fractures.

The purpose of this study is to share our experience at a level 1 major trauma centre in treating long bone fractures of the lower limb in nonagenarians. We aim to report the fracture incidence, short-term outcome and the 30-d, 1-year and 2-year mortality.

MATERIALS AND METHODS

This study was conducted at a level 1 major trauma centre. Interrogation of a prospectively maintained electronic admissions database was performed retrospectively. We included all patients between the ages of 90 and 99 years who were admitted with a long bone fracture of the lower limb during 2015 and 2016, including periprosthetic fractures. We excluded all soft-tissue trauma, foot and ankle fractures and all primary hip fractures.

Within our institution all patients who are fit to undergo anaesthesia are considered for surgery, depending on the fracture configuration, the aim of which is to restore the patient to their pre-injury function. Conservative (non-operative) management is reserved for patients who have undisplaced fractures and those that are unfit for surgery.

Information including patient demographics, place of residence, discharge destination, number of co-morbidities, gender, high or low mechanism of injury, fracture type and treatment, length of hospital stay and time to theatre from admission was collected from electronic patient records and picture archiving communication systems. The 30-d, 1-year and 2-year mortality was calculated for long bone fractures of the lower limb treated with or without surgery and compared using a Fisher's exact test. Statistical analysis was performed using R (R Foundation for Statistical Computing, Vienna, Austria) and a 2-sided *P* value below 0.05 was assumed to denote statistical significance.

RESULTS

A total of 537 adult lower limb fractures were admitted over a 12-mo period within our institution, with 30 Long bone fractures of the lower limb in 28 patients between 90 and 99 years of age. Twenty-seven patients (96%) were female and 1 (4%) was male (Table 1). The mean age in the surgical group was 93 years (range 90-98 years) (SD ± 2.59) and 94 years (range 91-96 years) (SD ± 2.07) in the conservative group (Figure 1).

Table 1 Patient demographics, fracture type, treatment type, number of comorbidities, length of hospital stay, admission residence, discharge destination and time from admission to death in both surgical and conservative groups

Patient No.	Sex	Age, yr	Fracture type	Treatment	Number of co-morbidities	Length of hospital stay, d	Admission residence	Discharge destination	Time from admission to death, d
1	F	98	Periprosthetic – THR	Surgery	3	22	Home	Institution	Alive
2	F	98	Distal femur	Surgery	3	25	Home	Home	Alive
3	F	96	Periprosthetic – Thompsons	Surgery	4	29	Institutional	Dead	29
4	F	96	Distal femur	Surgery	0	21	Home	Institution	Alive
5	F	96	Distal femur	Surgery	0	30	Home	Home	Alive
6	F	95	Periprosthetic – Thompsons	Conservative	5	20	Home	Institution	Alive
7	F	95	Distal femur	Surgery	3	8	Home	Institution	Alive
8	F	95	Periprosthetic – Thompsons	Surgery	3	12	Home	Institution	Alive
9	F	95	Distal tibia/fibula	Conservative	4	17	Institutional	Institution	237
10	F	95	Distal femur	Surgery	0	11	Home	Institution	300
11	F	94	Distal tibia/fibula	Surgery	0	18	Home	Institution	Alive
12	F	94	Periprosthetic – THR	Conservative	7	17	Home	Institution	376
13	F	94	Distal femur	Surgery	0	12	Home	Institution	429
14	F	94	Distal femur	Surgery	3	14	Home	Institution	264
15	F	93	Distal tibia/fibula	Surgery	3	24	Home	Institution	Alive
16	F	92	Periprosthetic – Thompsons	Conservative	2	24	Institutional	Institution	Alive
17	F	92	Periprosthetic – THR	Surgery	2	11	Home	Institution	Alive
18	F	92	Distal femur	Surgery	0	11	Home	Institution	Alive
19	F	92	Distal femur	Surgery	1	15	Home	Institution	39
20	F	92	Distal tibia/fibula	Surgery	2	39	Home	Institution	50
21	F	91	Distal femur-bilateral	Conservative	2	13	Home	Institution	Alive
22	F	91	Femoral shaft	Surgery	3	16	Home	Institution	50
23	F	91	Distal femur – Bilateral	Surgery	3	28	Home	Institution	Alive
24	F	90	Periprosthetic – THR	Surgery	1	28	Home	Institution	Alive
25	F	90	Periprosthetic – Thompsons	Surgery	8	28	Home	Institution	505
26	M	90	Distal femur	Surgery	4	11	Home	Institution	451
27	F	90	Femoral shaft	Surgery	2	17	Home	Institution	Alive
28	F	90	Proximal tibia/fibula	Surgery	1	5	Home	Institution	Alive

F: Female; M: Male; THR: Total hip replacement.

Twenty-seven patients (96%) sustained a fracture after low energy trauma with a fall from standing height. One patient sustained bilateral distal femoral insufficiency fractures without any history of trauma. Fracture type consisted of 12 (40%) distal femoral (two patients had bilateral distal femoral fractures), 11 (37%) periprosthetic, 4 (13%) distal tibia/

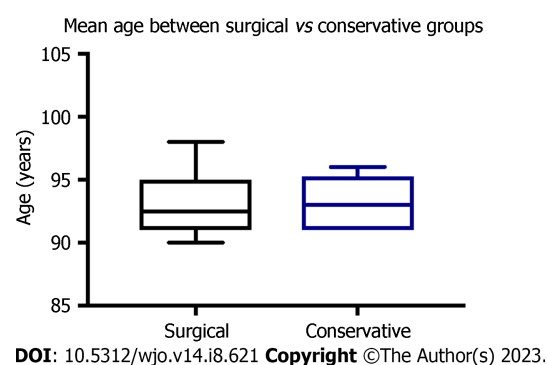


Figure 1 Mean of the patients age between surgical cohort (nonagenarians undergoing surgery) and conservative cohort (nonagenarians not undergoing surgery).

fibula, 2 (7%) femoral shaft and 1 (3%) proximal tibia (Figure 2).

Twenty-four fractures (80%) in 23 patients were operated on. Surgical intervention consisted of 8 (27%) undergoing open reduction and internal fixation, 5 (17%) a revision arthroplasty, 10 (33%) an intramedullary nail and 1 patient (3%) underwent a distal femoral replacement (Figures 3-5)

The mean time from admission to first surgery was 2.5 d (range 0-9 d). Definitive fracture treatment for all closed injuries was performed within 2.9 d (range 0-9 d). Four patients had open fractures, which were managed in accordance with the British Orthopedic Association Standards for Trauma and Orthopaedics[4] and treated with an initial debridement and external fixation before definitive treatment performed on a designated orthoplastic list. The mean time from admission to definitive fracture treatment in these patients was 2.5 d (range 2-3 d).

In 13 patients' operative records the type of anesthetic used was documented; 5 patients received a general anesthetic, 5 combined with regional blocks and 3 patients had a spinal anesthetic with sedation. In all patients, a tourniquet was not used primarily due to fracture location.

Within the surgical group ($n = 23$): 22 patients (96%) were admitted from their own home and 1 (4%) from an institution. Physiotherapy and continuous passive motion were started on the postoperative day. On discharge only 2 patients were discharged back home; the rest were transferred to further rehabilitation institutions. It is unknown how many of these patients were subsequently able to return to their prehospital admission residence.

The mean number of co-morbidities was 2.1, time to definitive surgery 2.6 d ($SD \pm 2.09$) and mean length of hospital stay was 18.2 d. The 30-d, 1-year and 2-year mortality in this group was 4.3%, 26% and 39% respectively.

Six fractures in 5 patients (20%) were treated conservatively. Within the conservative group ($n = 5$): 3 patients (60%) were admitted from their own home and 2 (40%) from an institution (Table 2). On discharge all patients were transferred to an institution. Mean number of co-morbidities was 4; mean length of hospital stay was 18.2 d. There were no deaths within 30 d; the 1-year and 2-year mortality was 20% and 40% respectively.

A comparison of mortality risk between the surgical and conservative groups found no evidence for a difference at any time point ($P = 1$ for each time point).

DISCUSSION

Long bone fractures of the lower limb in nonagenarians represents 5% of the total adult lower limb trauma admission during 1 year within our major trauma centre. Fractures within this age group nearly all result from low energy trauma and were found to be more prevalent in females. This study has found the most common lower limb fracture to occur is that of distal femoral fractures.

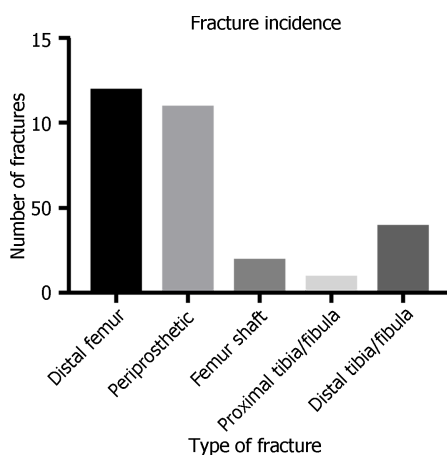
The most interesting finding of this study is surgically treated fractures of the lower limb is associated with an initial higher 30-d and 1-year mortality than those managed conservatively ($P = 0.97$, Wilcoxon-Rank), despite an increased number of comorbidities (see Figures 6 and 7). Reasons for this are likely to be multifactorial and we are unable to draw any direct conclusions due to a small cohort sample.

We are not aware of any literature which has specifically reported the mortality of fractures of the lower limb in nonagenarians. Streubel *et al*[5] reported a 25% 1-year mortality of patients with distal femoral fractures undergoing surgery with a mean age of 77.9 years[6]. The mortality of hip fractures has been well documented within literature. For similar age-matched groups the literature has reported 30-d and 1-year mortality between 10%-24% [5,7-9], rising to 15%-56% [10-13] in centenarians. Recently, Bolton *et al*[14] reported the 30-d and 1-year mortality rate in the non-agenarian hip fractures to be 12.4% and 38.1% [14].

We found surgery is more likely to be offered to patients with less comorbidity and those admitted from their own home. Postoperatively, however, all patients from both groups required admission into an institution for further rehabilitation. It is unclear how many patients were subsequently able to return to their preadmission residence. Interestingly we found there was no difference in the mean length of hospital stay between the two groups. This is similar to findings by Holton *et al*[15] where the mean hospital admission was longer in patients where their ankle fracture was treated with surgery ($P = 0.006$), compared to those offered conservative management.

Table 2 Summary showing discharge outcomes of both surgical (group 1) and conservative (group 2)

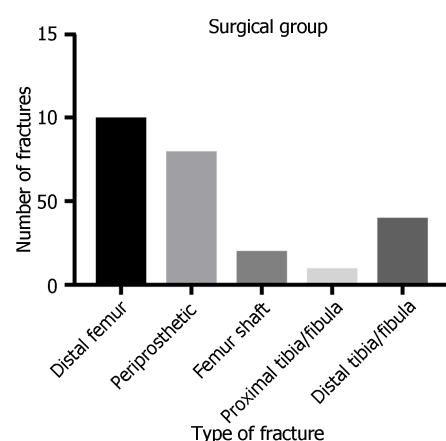
	No. of patients (%)
Gender	
Male	1 (3.6)
Female	27 (96.4)
Fracture type	
Distal femur	12 (40)
Periprosthetic	11 (37)
Distal tibia/fibular	4 (13)
Femoral shaft	2 (7)
Proximal tibia/fibula	1 (3)
Type of operation	
Open reduction internal fixation	8 (27)
Revision arthroplasty	5 (17)
Intramedullary nail	10 (33)
Distal femoral replacement	1 (3)
No operation	6 (20)
Surgical (Group 1)	
Admitted from home	22 (96)
Admitted from an institution	1 (4)
Discharged home	2 (9)
Discharged to an institution	21 (91)
Conservative (Group 2)	
Admitted from home	3 (60)
Admitted from an institution	2 (40)
Discharged home	0 (0)
Discharged to an institution	5 (100)



DOI: 10.5312/wjo.v14.i8.621 Copyright ©The Author(s) 2023.

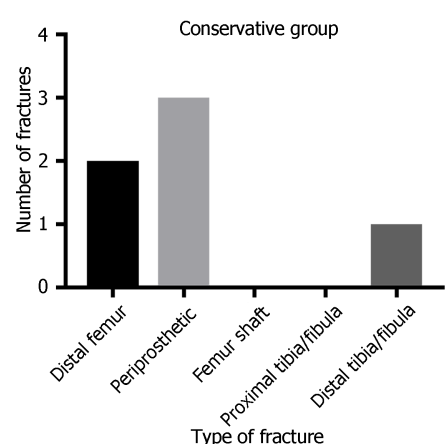
Figure 2 Anatomical fracture locations in both the surgical and conservative groups.

Surgery in nonagenarian patients is associated with greater anaesthetic risks and technically challenging surgery because of poor bone quality and higher rates of primary fixation failure[16-17]. Despite these factors surgery is often recommended especially for those with femoral neck fractures. Surgery aims to reduce pain, assist with nursing care, and



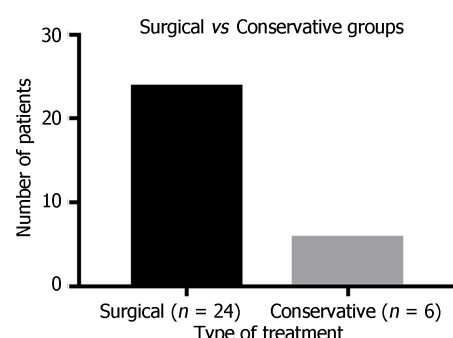
DOI: 10.5312/wjo.v14.i8.621 Copyright ©The Author(s) 2023.

Figure 3 Anatomical location of fractures with their incidence in surgical group.



DOI: 10.5312/wjo.v14.i8.621 Copyright ©The Author(s) 2023.

Figure 4 Anatomical location of fractures with their incidence in conservative group.



DOI: 10.5312/wjo.v14.i8.621 Copyright ©The Author(s) 2023.

Figure 5 Number of patients respective to the management offered—surgical and conservative.

reduce the risks and sequela of complications, which can manifest from prolonged bed rest[18]. Contrary to what we have found, recent studies suggest good results may be achieved with surgery. Ng and Kwek[10] reported the operative outcomes of centenarians with hip fractures. They found centenarians had a low Charlson Comorbidity Index, postulating these patients tended to be healthier and found no deaths at 30-d with 1-year mortality of 33.3%.

The timing of surgery is also a crucial factor that must be considered in these patients. Lin *et al*[8] analyzed 101 patients over the age of 90 years undergoing hip fracture surgery. They found the mortality nearly doubled if surgery was not performed within 24 h of admission. Moja *et al*[19] performed a meta-analysis involving 191873 patients, and again demonstrated an increase in the mortality of patients if there was a delay to surgery. Within our institution we recognize this, and the authors advocate early surgery for elderly patients; however, this is not always possible due to the volume of admissions requiring treatment, the surgeon skill set and the requirement for specialized implants.

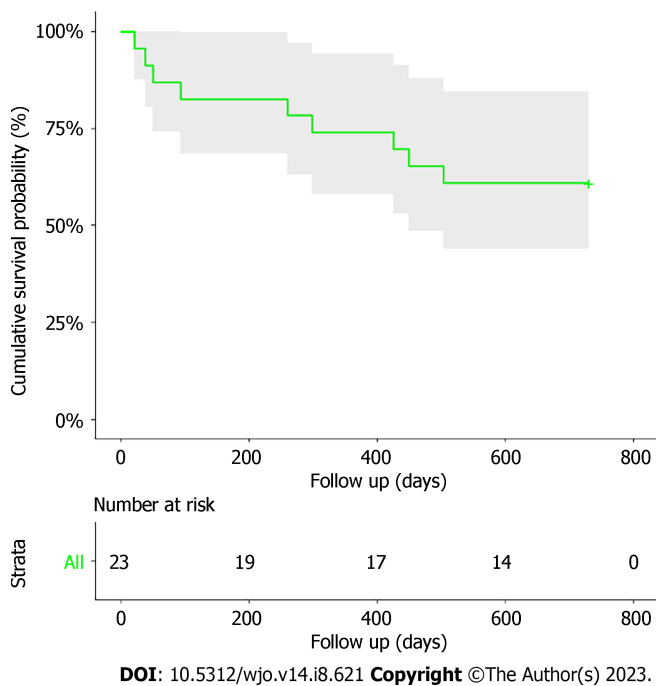


Figure 6 Cumulative survival probability (Y-axis) and follow-up in days (X-axis) showing survival analysis curve in Surgical group.

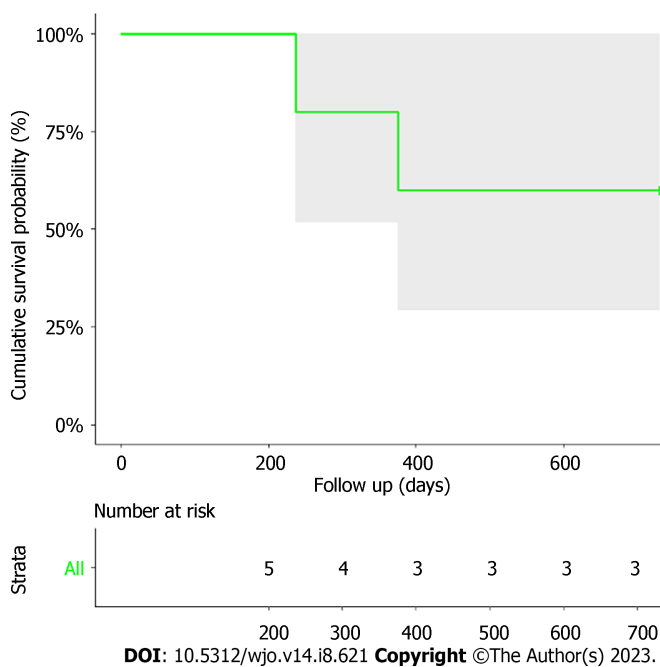


Figure 7 Cumulative survival probability (Y-axis) and follow-up in days (X-axis) showing survival analysis curve for conservative group.

We recognize the limitations of this study, the most important of which is a small sample size for both groups. This makes it difficult to make a direct comparison between the two groups and as a result we are unable to draw any direct conclusions. Secondly, we are unable to comment on how many patients were able to return to their preadmission residence and functional status. Nevertheless, this study highlights super-elderly patients require further rehabilitation than their younger counterparts[9] and reflects an additional socioeconomic burden on limited health resources which must be addressed.

Nonagenarians have multiple co-existing medical pathologies including frailty, poor visual acuity, and polypharmacy, all of which contribute to increase the risk of falls[16]. We found 23 patients (82%) suffered a fall from standing height at home. This suggests certain patients may benefit from primary prevention strategies by identifying at risk individuals with the focus of creating a safe environment and falls prevention advice through a multidisciplinary team approach and to improve their living environment with assisted living devices.

CONCLUSION

We report the incidence and the short-term outcome of fractures of the lower limb in nonagenarians at our level 1 trauma centre. The main findings of this study are that surgery is more likely to be offered to those patients with fewer comorbidities and those admitted from their own home, which indicates a higher functional status. Nonagenarians in the surgical group had similar length of hospital stay and mortality risks as those treated conservatively.

Nonagenarians require further rehabilitative support to gain independence and pre-injury functional level, in an institutive setting irrespective of the treatment that is instituted and arrangements for this should be sought as soon as possible. More investment, awareness and socioeconomic support will be required to keep up with current demands.

ARTICLE HIGHLIGHTS

Research background

There is paucity of literature pertaining to the management and survival of non-hip fractures in the nonagenarian population. This is significant, given the rising nonagenarian population in the United Kingdom.

Research motivation

This study aims to analyze the prognosis/survival in a level 1 major trauma centre, in managing non-hip fractures in nonagenarian population in the United Kingdom.

Research objectives

To summarize the survival prognosis on nonagenarian population with non-hip fractures in a level 1 major trauma centre.

Research methods

We referred to the hospital electronic database between 2015 and 2016 to include all patients with age ranging from 90 to 99 years, who had lower limb long bone fractures, including periprosthetic fractures. We excluded all hip fractures, soft tissue trauma, foot and ankle fractures. Both conservative and operative management were considered depending on the anaesthetic fitness and medical background. 30-d, 1-year and 2-year mortality were calculated for both surgical and conservative groups and compared using Fisher's exact test.

Research results

Out of 28 patients, 23 patients (24 fractures) had surgical intervention and 5 patients (6 fractures) were for conservative treatment. The mean time from admission to definitive fracture treatment was 2.5 d (range 2-3 d). In surgical cohort, only 2 patients went home post-discharge, the rest all were transferred to rehabilitation institutions. In the conservative cohort, all patients were transferred to an institution. The 30-d, 1-year and 2-year mortality risks were 1/23, 6/23 and 9/23 (4%, 26% and 39%) in the surgery group and 0/5, 1/5 and 2/5 (0%, 20% and 40%) in the conservative group, with no evidence for a difference between the two groups at any time point.

Research conclusions

Surgery was more likely to be offered to patients with fewer comorbidities and both conservative and surgical groups had similar length of hospital stay and mortality risks. Early planning for institutional rehabilitation and socio-economic support is utmost needed in the management of these patients.

Research perspectives

Standard national guidelines for lower limb fractures in the nonagenarian population would streamline the diagnosis, management, and rehabilitation.

ACKNOWLEDGEMENTS

We thank Dr Jan-Herman Kuiper (Department of Biomechanics at Keele University) and Dr Siddaling Hugar (Department of Community Medicine, Mandya Institute of Medical Sciences, Karnataka, India) for their contributions in statistical analysis and amendments.

FOOTNOTES

Author contributions: Narayana Murthy S, Siddiqui RS and Cheruvu MS conceptualized, designed, reviewed the existing literature, did the statistical analysis, wrote the manuscript and prepared the first draft; Dass D and Sharma N critically reviewed the first draft and gave their expert suggestions; Ali A reviewed the final draft before submission and suggested further changes.

Institutional review board statement: This is an observational study which does not include any of the patient identifiable data. Additionally, as there are no interventions, there was no need to obtain an institutional board review statement.

Informed consent statement: Consent for an original study involving humans is not necessary as we have not included any patient identifiable details in our manuscript.

Conflict-of-interest statement: All the authors report no relevant conflicts of interest for this article.

Data sharing statement: As no patient identifiable data is shared in the manuscript, this is not required. No additional data is available.

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Noncommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

Country/Territory of origin: United Kingdom

ORCID number: Sanjay Narayana Murthy 0000-0003-2852-6824.

S-Editor: Li L

L-Editor: A

P-Editor: Chen YX

REFERENCES

- 1 Johnell O. The socioeconomic burden of fractures: today and in the 21st century. *Am J Med* 1997; **103**: 20S-25S; discussion 25S [PMID: 9302894 DOI: 10.1016/S0002-9343(97)90023-1]
- 2 Clement N, Court-Brown CM. Fourscore years and ten: the fracture epidemiology of the super-elderly. *Injury Extra* 2009; **40**: 235-235 [DOI: 10.1016/j.injury.2009.06.307]
- 3 Office for national statistics. Data and analysis from Census 2021. [cited 21 July 2023]. Available from: <https://www.ons.gov.uk/>
- 4 British Orthopaedic Association. The British Orthopaedic Association Surgical Standard 4 (BOAST). [cited 21 July 2023]. Available from: <https://www.boa.ac.uk/standards-guidance/boasts.html>
- 5 Streubel PN, Ricci WM, Wong A, Gardner MJ. Mortality after distal femur fractures in elderly patients. *Clin Orthop Relat Res* 2011; **469**: 1188-1196 [PMID: 20830542 DOI: 10.1007/s11999-010-1530-2]
- 6 Hapuarachchi KS, Ahluwalia RS, Bowditch MG. Neck of femur fractures in the over 90s: a select group of patients who require prompt surgical intervention for optimal results. *J Orthop Traumatol* 2014; **15**: 13-19 [PMID: 23860690 DOI: 10.1007/s10195-013-0248-9]
- 7 Pavic R, Court-Brown CM, Clement N. Four score years and ten; an analysis of the epidemiology of fractures in the very elderly [Injury 2009;40(October (10)):1111-4]. *Injury* 2011; **42**: 224 [PMID: 20045107 DOI: 10.1016/j.injury.2009.12.007]
- 8 Lin WT, Chao CM, Liu HC, Li YJ, Lee WJ, Lai CC. Short-term outcomes of hip fractures in patients aged 90 years old and over receiving surgical intervention. *PLoS One* 2015; **10**: e0125496 [PMID: 25978368 DOI: 10.1371/journal.pone.0125496]
- 9 Anderson SA, Li X, Franklin P, Wixted JJ. Ankle fractures in the elderly: initial and long-term outcomes. *Foot Ankle Int* 2008; **29**: 1184-1188 [PMID: 19138481 DOI: 10.3113/FAL.2008.1184]
- 10 Ng WX, Kwek EB. Too Old for Surgery? Outcomes of Hip Fracture Surgery in Centenarians. *Ann Acad Med Singap* 2017; **46**: 115-117 [PMID: 28417136 DOI: 10.47102/annals-acadmedsg.V46N3p115]
- 11 Tarity TD, Smith EB, Dolan K, Rasouli MR, Maltenfort MG. Mortality in centenarians with hip fractures. *Orthopedics* 2013; **36**: e282-e287 [PMID: 23464947 DOI: 10.3928/01477447-20130222-15]
- 12 Forster MC, Calthorpe D. Mortality following surgery for proximal femoral fractures in centenarians. *Injury* 2000; **31**: 537-539 [PMID: 10908747 DOI: 10.1016/S0020-1383(00)00049-8]
- 13 Oliver CW, Burke C. Hip fractures in centenarians. *Injury* 2004; **35**: 1025-1030 [PMID: 15351671 DOI: 10.1016/j.injury.2003.10.004]
- 14 Bolton D, Bush C, Wallace MT. Nonagenarian hip fractures: Morbidity and mortality at a single institution. *J Clin Orthop Trauma* 2021; **14**: 69-73 [PMID: 33717899 DOI: 10.1016/j.jcot.2020.09.020]
- 15 Holton J, Nandra R, Thurston D, Ali S. The management of ankle fractures in octogenarian and nonagenarians. What is the optimum mode of treatment? *Int. J. Orthop. Sci* 2017; **3**: 467-470 [DOI: 10.22271/ortho.2017.v3.i1f.70]
- 16 Strauss EJ, Egol KA. The management of ankle fractures in the elderly. *Injury* 2007; **38** Suppl 3: S2-S9 [PMID: 17723786 DOI: 10.1016/j.injury.2007.08.005]
- 17 Roebuck J. When does old age begin?: The evolution of the English definition. *J Soc Hist* 1979; **12**: 416-428 [DOI: 10.1353/jsh/12.3.416]
- 18 Holt G, Macdonald D, Fraser M, Reece AT. Outcome after surgery for fracture of the hip in patients aged over 95 years. *J Bone Joint Surg Br* 2006; **88**: 1060-1064 [PMID: 16877606 DOI: 10.1302/0301-620X.88B8.17398]
- 19 Moja L, Piatti A, Pecoraro V, Ricci C, Virgili G, Salanti G, Germagnoli L, Liberati A, Banfi G. Timing matters in hip fracture surgery: patients operated within 48 h have better outcomes. A meta-analysis and meta-regression of over 190,000 patients. *PLoS One* 2012; **7**: e46175 [PMID: 23056256 DOI: 10.1371/journal.pone.0046175]



Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

Telephone: +1-925-3991568

E-mail: bpgoffice@wjgnet.com

Help Desk: <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

