



## The role of edmonton frailty scale and asa grade in the assessment of morbidity and mortality after fracture neck of femur in elderly

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Frailty is a complex syndrome which affects the energy, physical ability, cognition and general health. Hip fractures are associated with causes and consequences of frailty such as osteoporosis, frequent falls, low body mass index, multiple medications and cognitive impairment. The aim of our study is to assess the value of ASA grade and Edmonton frailty score in the outcome of treatment of fracture neck of femurs in elderly patients.

192 patients admitted with fracture neck of femur were included in the study. The mean age was 79.23 years. 120 patients had ASA grade 3, 56 patients had ASA grade 2 and 16 patients had ASA grade 1. The frailty index was calculated using Edmonton scoring index. Ninety four patients (49%) had low frailty score and 88 patients (51%) had a high frailty score of more than 10. All patients were followed up 4 weeks and one year after the surgery.

In conclusion the patients with frailty scores and ASA grade have got more chance of developing wound infection. They also have got higher incidence of mortality and morbidity following fracture neck of femur.

**Keywords :** Frailty Index ; ASA grade ; Morbidity ; Mortality ; Functional Outcomes.

### INTRODUCTION

Frailty is defined as a state of increased vulnerability due to decrease in the physiological reserve of an individual (15,19). Hip fractures are caused

by accidental falls (20) and the main predisposing factors are age, osteoporosis, poor mobility, postural imbalance, anemia and other co-existing morbidities (6,10). Hip Fractures are also associated with significant morbidity and mortality and most of the time the patients does not attain the pre fracture ambulatory status (25).

The development of frailty in an individual is basically depending on the age related changes to various physiological systems in the body especially neuroendocrine, neuromuscular and immunological systems (11). The changes in the various physiological systems can add up and when a cumulative threshold is reached, the physiological function and reserve starts to decline rapidly. It will then become difficult for the body to maintain the physiological homeostasis when it is exposed to various stressors. Thus it will have an adverse effect on the whole individual. The resulting frailty phenotype includes sarcopenia, anorexia, osteoporosis, fatigue, risk of falls and poor physical health (27).

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Sarcopenia is one of the most important elements of frailty, represented by progressive and generalized loss of muscle bulk and strength leading to adverse physical health, poor quality of life and death (7). The mechanisms involved in the development of sarcopenia are decrease in protein synthesis, proteolysis, neuromuscular integrity and muscle fat content (4). The association between muscle fibre loss, muscle fibre atrophy and multiple contributory factors such as nutritional, hormonal, metabolic and immunological also can lead to the development of sarcopenia (8).

The Edmonton Frailty Scale (EFS) is a concise, reliable and easy to use by both clinicians and non-clinicians to assess the frailty of elderly people (24). EFS measures nine domains including cognition, general health, functional independence, social support, medications, nutrition, mood, continence and self-reported performance.

The aim of our study is to assess the value of ASA grade and Edmonton frailty scale in the outcome of treatment of fracture neck of femurs in elderly patients.

## MATERIALS AND METHODS

A consecutive series of 220 patients admitted with fracture neck of femur over a period of three years were included in the study. They were assessed within 24 hours of admission by the geriatric medicine consultant and optimised for surgery. The patients were scored pre-operatively using the Edmonton frailty scale (Table 1) and their ASA grade determined by anaesthetic trainees. After surgery the patients were managed in the ward by the geriatric medical team.

The patients were mobilised under the supervision of specialist physiotherapist. The post-

Table 1. — Edmonton Frailty Scale

Frailty Domain	Item	0 points	1 point	2 points
<b>Cognition</b>	Please imagine this pre-circle is a clock. I would like you to place the numbers in the correct positions, then the hands to indicate a time of 'ten after eleven'	No errors	Minor errors	Other errors
<b>General Health Status</b>	In the past year how many times have you been admitted to the hospital? In general how will you describe your health?	0 Excellent/Very good/Good	1-2 Fair	$\geq 2$ Poor
<b>Functional Independence</b>	With how many of the following activities do you require help? meal preparation/shopping/transportation/ telephone/housekeeping/laundry/ managing money/ taking medications	0-1	2-4	5-8
<b>Social Support</b>	When you need help, can you count on someone who is willing and able to meet your needs	Always	Sometimes	Never
<b>Medication Use</b>	Do you use five or more different medications on a regular basis? At times, do you forget to take your prescription medications?	No No	Yes Yes	
<b>Nutrition</b>	Have you recently lost weight such that your clothing has become looser?	No	Yes	
<b>Mood</b>	Do you often feel sad or depressed?	No	Yes	
<b>Continence</b>	Do you have a problem with losing control of urine when you don't want to go?	No	Yes	
<b>Self-Reported Performance</b>	Two weeks ago, were you able to: (1) Do heavy work around the house like washing windows, walls or floors without help (2) Walk up and down stairs to the second floor without help (3) Walk 1km without help	Yes Yes Yes	No No No	

Scoring for Edmonton Frailty scale: (0/18). Not frail: 0-5. Apparently Vulnerable : 6-7. Mildly Frail : 8-9. Moderate frailty : 10-11. Severe Frailty : 12-18.

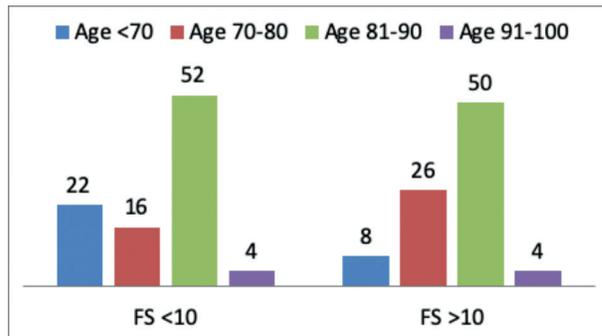


Fig. 1. — Graph showing the different age groups with low and high frailty indices.

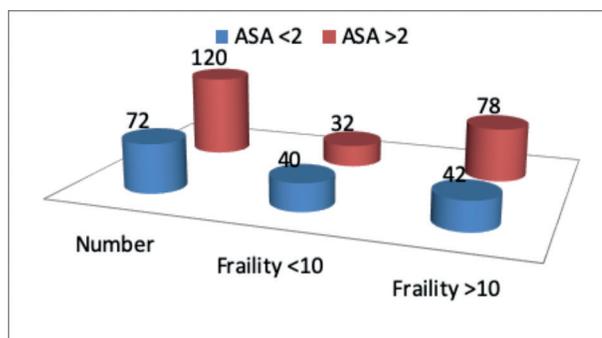


Fig. 2. — Graph showing the number of patients with low and high ASA grades in both frailty groups.

operative follow up was done by the elderly medicine orthopaedic practitioner at four weeks and twelve months. The follow up was done at the fragility clinic and by telephone interviews. The data collected are morbidity and mortality in 28 days and time to discharge, mortality at 12 months and functional outcomes.

The maximum score for Edmonton frailty index is 18. In our study we divided the number of patients in to two groups. Those who had a frailty score of less than 10 were classed as low frailty and those patients with frailty score more than 10 were classed as high frailty.

## RESULTS

Out of 220 patients who were originally included in the study, full data available for only for 192 patients. The mean age was 79.23 years. 120 patients (62.5%) had ASA grade 3, 56 patients (29.2%) had ASA grade 2 and 16 patients (8%) had ASA grade 1. Ninety four patients (49%) had frailty score of

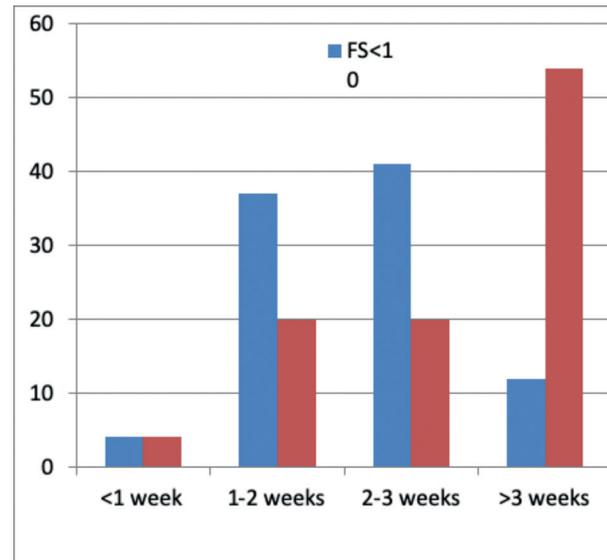


Fig. 3. — Time to discharge in patients with low and high frailty scores

less than 10 and 98 patients (51%) had a frailty score of more than 10. Fifty (57%) patients in the high frailty score were in the age group between 81-90 years (Fig 1). Seventy eight patients (65%) with high frailty index had ASA grade of 3 compared to 32 patients (44%) in low frailty index group (Fig 2).

Eighty two patients (87%) with low frailty scores were discharged within 3 weeks of admission. But in patients who had a high frailty scores the time to discharge was more than 3 weeks in 54 (55%) patients (Fig 3).

Thirty six patients (41%) in high frailty group had perioperative complications which included superficial wound infection (8), deep wound infection (8), lower respiratory tract infection (4), urinary tract infection (12), deep vein thrombosis (4) Table 2.

At 28 days follow up 20 patients (10.4%) died. All these patients had an ASA grade more than 2 and frailty score above 10. At the end of one year a total of 44 patients (23%) died from both low and high frailty groups, of which thirty two patients (36.4%) had ASA grade more than 2 and frailty score above 10.

## DISCUSSION

There are different types of frailty scores and indices available in the literature. They can be

Table 2. — Perioperative complications in high frailty group

Superficial wound infection	8
Deep wound infection -	8
Pneumonia	4
Urinary tract infection	12
Deep vein Thrombosis	4

broadly classified in to Frailty Phenotypes and Frailty Indices. In the phenotype variety the main domains are nutritional status, Physical activity, mobility, strength and energy (12,3,22,17). In the index group two more additional domains are assessed including mood and social support. In the modified Functional Independence Measure (FIM), seven functional dimensions such as feeding, hygiene, bathing, toileting, dressing, communication and mobility is measured (2). Groningen Frailty Indicator (GFI) is a fifteen item questionnaire on eight frailty factors including mobility, physical fitness, vision, hearing, nourishment, morbidity, cognition and psychosocial aspects of the elderly patient are assessed (26). Frail Elderly Functional Assessment Questionnaire is 19 item questionnaire on mobility, toileting, meals, eating, washing dishes, dressing, mechanical skills, handling finances, communication over telephone and medication administration (13,14), Table 3. In our study we used Edmonton Frailty index which is a nine domain frailty indicator with a maximum score of 18 (24).

The term sarcopenia was first put forward by Irwin Rosenberg in 1989 to describe the decrease

in age related muscle mass (23). The term geriatric syndrome is used to elaborate the signs and symptoms of common health conditions in older people. It includes delirium, falls, incontinence, and frailty (16). Recently there has been a move to recognize sarcopenia as a geriatric syndrome. Sarcopenia is prevalent in older age groups and associated with poor nutrition, increased risk of falls and fragility fractures, impaired physical health leading to loss of independence and eventually death are some of the factors supporting this proposal (5). Sarcopenia can be divided in to primary and secondary depending on the identifiable causes. Primary sarcopenia is age related. Secondary sarcopenia can be activity, disease or nutrition related. Sarcopenia can be staged in to three stages namely pre-sarcopenia, sarcopenia and severe sarcopenia depending on the severity (4).

Fried et al described five key components in the clinical recognition of frailty of a person. They are self-reported weight loss of more than 4.5kg per year, self-reported exhaustion on CSE-D scale (Centre for epidemiological Studies Depression) for most of the time of the week, energy expenditure of less than 383 Kcal/week for males and less than 270 Kcal/week for females, slowness which includes standardised cut off times to walk fifteen feet, stratified for sex and height and weakness example grip strength ,stratified for sex and BMI (Body Mass Index). Persons with three or more indicators are considered to be frail (12).

Table 3. — Different studies showing frailty factors and indicators

Study	Year	Nutritional status	Physical activity	Mobility	Strength	Energy	Cognition	Mood	Social Support
Fried et al <sup>13</sup>	2001	+	+	+	+	+	+	+	+
Cigolle et al <sup>14</sup>	2009	+	+	+	+	+	+	+	+
Rockwood et al <sup>15</sup>	2007	+	+	+	+	+	+	+	+
Kiely et al <sup>16</sup>	2009	+	+	+	+	+	-	-	-
Carlson et al <sup>17</sup>	1998	+	-	+	-	-	-	-	-
Schuermans et al <sup>18</sup>	2004	+	-	+	-	-	+	+	+
Gloth et al <sup>19,20</sup>	1995 1999	-	-	+	-	-	-	-	-
Rajeev et al (Current Study)	2016	+	+	+	+	+	+	+	+

ASA (American Society of Anaesthesiologist) grading is most widely used by anaesthetist for assessing the risk and outcomes following administration of anaesthesia. A combined assessment of elderly patients with both ASA grade and Frailty index will help to calculate the risk, morbidity and mortality following surgical anaesthesia (1). Our study showed that higher the ASA grade the frailty score was also high.

There is also a direct relationship with the frailty index and mean length of stay in the hospital after fracture neck of femur surgery. Krishnan et al has in a comprehensive study of geriatric patients with fracture neck of femur has concluded that higher the frailty score longer the inpatient stay (18). In our study 64% of patients with high frailty index had an inpatient stay of more than 3 weeks.

There are only fewer studies which looked at the morbidity and mortality in ageing patients with increased frailty. Farhat et al in their study used a modification of the Canadian Study of Health and Aging Frailty Index to predict morbidity and mortality in patients older than 60 years undergoing emergency general surgery. They assessed the post-operative outcomes of wound and any other infection and mortality of this group of patients. They concluded that modified frailty index can be used to evaluate risk of both morbidity and mortality in these patients and is a valuable preoperative risk assessment tool for the acute care surgeon (9).

Patel et al also using a modified frailty index based on Canadian Study of Health and Aging Frailty Index Demonstrated that mortality at both 1 and 2 years after sustaining a femoral neck fracture in patients aged 60 years and older is higher (21). In our study also patients with fracture neck of femurs who had higher EDF score index showed higher mortality compared to that with lower scores.

### CONCLUSION

The pre-fracture general health, functional and ambulatory level (Frailty index) determines the outcome of treatment of fracture neck of femurs. The higher the frailty index and the ASA grade the incidence of morbidity and mortality are higher. The inpatient stay is prolonged and the functional outcomes are poor in this group of patients.

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