The effect of COVID-19 pandemic on the care of fragility hip fracture patients in the United Kingdom. A case control study in a major trauma centre

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ABSTRACT

Introduction: Coronavirus disease 2019 is a pandemic that forced a transformation in the services provided by the National Health Service in the United Kingdom. Fragility hip fractures account for over 65,000 cases per year in the elderly population. The study aims to assess the impact of the pandemic on fragility hip fractures.

Methods: A retrospective data gather was performed to identify fragility hip fractures from the 23rd of March 2020 to the 13th of May 2020, and from the 23rd of March 2019 to the 13th of May 19. Two groups were formed and compared over their 30 day follow up.

Results: The control group comprised of 97 patients, with a mean age of 82.1 years old (62–102 years) and M:F ratio of 38:59. The case group comprised of 102 patients, with a mean age of 82.3 years old (60–100 years) and a M:F ratio of 16:86. Significant differences between groups were identified for gender ($p < 0.001$), time to theatre ($p = 0.002$), length of stay ($p < 0.001$) and COVID-19 status ($p = 0.001$). In the Case group, association with mortality was found for male gender ($p = 0.041$), right side ($p = 0.031$) and COVID-19 positive test results ($p = 0.011$).

Conclusion: Early surgical intervention is advocated wherever possible, and sufficient optimisation, prior to surgery whenever a COVID-19 positive patient is identified. A safe rehabilitation environment is paramount for recovery in this group of patients. Further studies are required to understand the effect of this pandemic on the fragility hip fractures.

Level of evidence: Level III: Retrospective case–control study.

Introduction

The World Health Organization (WHO) declared the Coronavirus disease 2019 (COVID-19) a public health emergency on January 2020, tracing its start to Wuhan, China. COVID-19 was declared a pandemic on the 11th of March 2020, making it the first pandemic since H1N1 in 2009.[1,2]

The COVID-19 pandemic caused a transformation in the services provided by the National Health Service (NHS), in the United Kingdom. Emergency guidelines were issued to aid the management of trauma during this time.[3–5] This has altered various treatment pathways and protocols. To prepare for the anticipated surge in COVID-19 cases, our hospital implemented numerous procedures, such as staff redeployment, cancellation of elective services and

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repurposing of theatre and recovery areas into intensive care facilities.

Fragility hip fractures are common in the elderly population, with over 65,000 cases per year reported in the United Kingdom. In an average trauma unit, hip fracture care accounts for a large proportion of the daily trauma work load.[6] Hip fracture management follows an agreed care pathway, as per guidelines and outcomes are recorded in the National Hip Fracture Database (NHFD).[6,7] A multi-disciplinary approach is utilised in treating this group of patients, which expedites surgical management and it is associated with a reduction in morbidity and mortality.[8,9] The NHS England specialty guidelines for the COVID-19 crisis, state that the care of patients with hip fractures remains urgent and is a surgical priority "Obligatory In patient".[4]

In response to the COVID-19 pandemic, our hospital diverted resources and staff to reconfigure clinical areas, in order to facilitate the management of excess load induced by the pandemic. The theatre capacity was reduced to 4 theatres per day, shared between all surgical specialties including general surgery, urology, orthopaedics, spine surgery, neurosurgery, cardiothoracic surgery and plastic surgery. The health board took the decision to treat all operative cases as potentially COVID-19 positive. This lead to all theatre personnel wearing full personal protective equipment, as to avoid transmission from aerosol generating procedures (AGP).[10]

Our Hospital is a major trauma centre, which experiences a large annual volume of patients with fragility hip fractures. In 2019, 725 hip fractures were treated with an average 30 day mortality rate of 5.5% and an average time to surgery of 43 h.[11] The aim of this study is to assess the impact of COVID-19 in the management and care of fragility hip fractures.

Patients and methods

The United Kingdom went into full lockdown from the 23rd of March 2020 to the 13th of May 2020.[12,13] A retrospective data collection between those dates was performed in our Major Trauma Centre (MTC), identifying every hip fracture that was admitted under our care (Case group-2020). A Control group (2019) was formed using the same criteria for all of our hip fractures admitted between the 23rd of March 2019 and the 13th of May 2019. Outcomes were compared between the two cohorts to identify the impact of COVID-19 in our practice. The data gather was specific for the first 30 days post admission and radiological identification of the fracture.

The inclusion criteria were individuals presenting with a proximal femoral fracture in our emergency department, diagnosed radiologically from a low energy mechanism of injury (fall from standing height, <1 m). Participants were excluded if they were under the age of 60 years old, had a pre-existing metastatic deposit causing the hip fracture, or were diaphyseal or distal femoral fractures.

Basic demographic data was gathered, including, age, gender, laterality and residence. The abbreviated mental test score (AMTS) and the clinical frailty scale were measured to identify mental and functional pre-operative status.[11,14] Data gathered included preoperative mobility (independent, stick, frame, non-mobile), American Society of Anaesthesiologists (ASA) grade,[15] fracture type as per NHFD, operation performed, time to theatre (h), length of stay (days), 30 day morbidity, 30 day mortality and COVID-19 status. The fracture classification was divided to intracapsular undisplaced, intracapsular displaced, extracapsular A1/A2, extracapsular A3 (reverse oblique) and subtrochanteric (up to 5 cm below the lesser trochanter). The operations performed included cemented hemiarthroplasty (Exeter Trauma Stem), uncemented hemiarthroplasty (Thompsons), dynamic hip fixation (DHS), intramedullary nailing (IM nail) and total hip arthroplasty THA.

Continuous variables were presented as mean and range, and categorical variables as number and percentage. Data analysis was performed by utilising the student *t*-test for continuous variables and the chi square test for categorical numbers. A p value of less than 0.05 was considered significant and was used as a measure of association between the groups. The power of this study is 0.924 and the β was 0.076 in our sample population. The SPSS v23 was used for data analysis.

Results

The Control group comprised of 97 patients with a mean age of 82.1 years old (62–102 years). There were 38 male (39.2%) patients and 59 female (60.8%) patients, with 53 (54.6%) left and 44 (45.4%) right hip fractures. Out of 97, 74 (76.3%) resided in their own home and 23 (23.7%) resided in a care or nursing home. The patients preoperative mobility was 42 (43.3%) being independent, 23 (23.7%) using a stick, 32 (32.0%) using a frame and 1 (1.0%) being non-mobile. The most common ASA grade was grade 3 (50.5%) and the most common clinical frailty scale score was 4 (25.8%). The mean AMTS was 7 (0–10) and the median AMTS was 9. The fracture classification identified 29 (29.9%) A1/A2 type fractures, 12 (12.4%) A3 type fractures, 5 (5.2%) intracapsular undisplaced fractures, 45 (46.4%) intracapsular displaced fractures and 8 (6.2%) subtrochanteric type fractures (Fig. 1). The type of operation was 25 (25.8%) cemented hemiarthroplasties, 9 (9.3%) uncemented hemiarthroplasties, 40 (41.2%) DHSs, 7 (7.2%) IM nails, 9 (9.3%) THAs and 7 (7.2%) were treated conservatively (Fig. 2). The mean time to theatre was 41.7 h (12–192 h) and the mean length of stay was 18.1 days (3–52 days). There were 43 (44.3%) patients identified with a postoperative morbidity, which included acute kidney injuries, urinary infections, electrolyte disturbances, pneumonia, anaemia required transfusion, deranged clotting, arrhythmia, dislocation, stroke, seizure and rectal bleed. Eight (8.2%) patients had died within 30 days post operatively, 3 of which were treated conservatively.

The Case group comprised of 102 patients with a mean age of 82.3 years old (60–100 years). There were 16 male (15.7%) patients and 86 female (84.3%) patients, with 62 (60.8%) left and 40 (39.2%) right hip fractures. Out of 102, 81 (79.4%) resided in their own home and 21 (20.6%) resided in a care or nursing home. The patients preoperative mobility was 51 (50.0%) being independent, 26 (25.5%) using a stick, 24 (23.5%) using a frame and 1 (1.0%) being non-mobile. The most common ASA grade was grade 3 (60.8%) and the most common clinical frailty scale

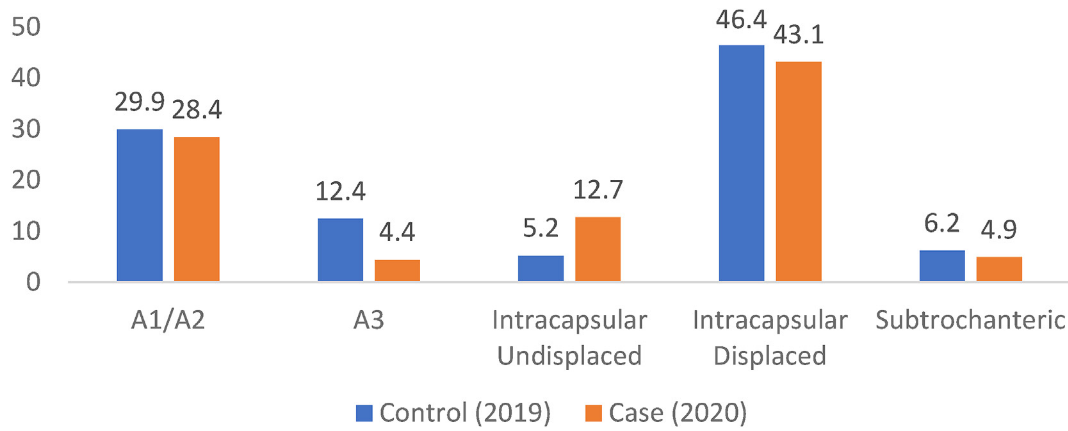

Fig. 1 – Bar chart of fracture classification per group in percentages.

score was 5 (22.5%). The mean AMTS was 7 (0–10) and the median AMTS was 9. The fracture classification identified 29 (28.4%) A1/A2 type fractures, 11 (10.8%) A3 type fractures, 13 (12.7%) intracapsular undisplaced fractures, 44 (43.1%) intracapsular displaced fractures and 5 (4.9%) subtrochanteric type fractures (Fig. 1). The type of operation was 25 (24.5%) cemented hemiarthroplasties, 15 (14.7%) uncemented hemiarthroplasties, 40 (39.2%) DHSs, 9 (8.8%) IM nails, 6 (5.9%) THAs and 7 (6.9%) were treated conservatively (Fig. 2). The mean time to theatre was 25.5 h (2–255 h) and the mean length of stay was 12.3 days (2–36 days). There were 39 (38.2%) patients identified with a postoperative morbidity, which included acute kidney injuries, urinary infections, electrolyte disturbances, pneumonia, anaemia required transfusion, deranged clotting, arrhythmia and wound ooze. Eight (7.8%) patients had died within 30 days post operatively. Finally, 11 (10.8%) were found to be COVID-19 positive on testing.

When the Control group was compared to the Case group significant differences were identified with gender ($p < 0.001$), time to theatre ($p = 0.002$), length of stay ($p < 0.001$) and COVID-19 status ($p = 0.001$). There was no association with age ($p = 0.818$), laterality ($p = 0.380$), residence ($p = 0.596$), preoperative mobility ($p = 0.610$), ASA grade ($p = 0.222$), AMTS (0.638), clinical frailty score ($p = 0.459$), fracture classification ($p = 0.466$), type of operation ($p = 0.817$), 30 day morbidity ($p = 0.383$) and 30 day mortality ($p = 0.917$).

In the Case group, association with mortality was found with male gender ($p = 0.005$), right side ($p = 0.031$) and COVID-19 positive status ($p = 0.011$). There was no association with residence ($p = 0.556$), preoperative mobility ($p = 0.066$), clinical frailty score ($p = 0.558$), fracture classification ($p = 0.358$), type of operation ($p = 0.260$) and 30 day morbidity ($p = 0.141$).

Out of the 11 COVID-19 positive patients, 10 (90.9%) were operated and 1 (9.1%) was treated conservatively. At the 30 day follow up, 3 (27.3%) out of 11 patients had died and all of them were from the operative group.

Discussion

The COVID-19 pandemic has created an unprecedented situation, which has generated a serious public health concern.[1,2,16] In our study between the two groups, we found many similarities between different variables. Differences were identified for gender ($p < 0.001$), time to theatre ($p = 0.002$), length of stay ($p < 0.001$) and COVID-19 status ($p = 0.001$).

Regarding gender, Table 1 demonstrates that the Case group had substantially more females (84.3%), which serves to

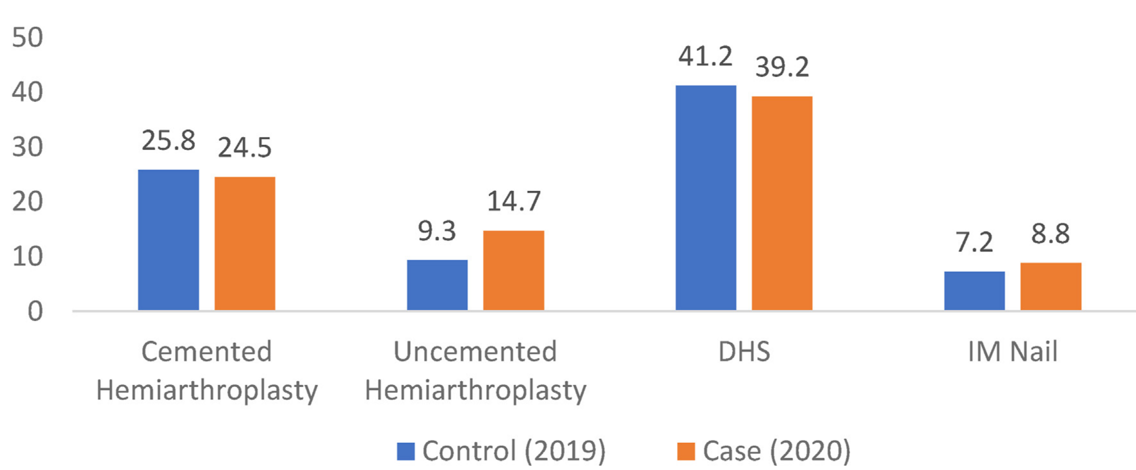

Fig. 2 – Bar chart of operative intervention per group in percentages.

Table 1 – Table outlining data per group and significance.

	Control Group (2019)		Case Group (2020)		*p*-value
	N (97)	Percentage	N (102)	Percentage	
Age (years)	Mean 82.1 (62–102)		Mean 82.3 (60–100)		0.818
Sex					
Male	38	39.2%	16	15.7%	**<0.001**
Female	59	60.8%	86	84.3%	
Laterality					
Left	53	54.6%	62	60.8%	0.380
Right	44	45.4%	40	39.2%	
Residence					
Own	74	76.3%	81	79.4%	0.596
Sheltered	23	23.7%	21	20.6%	
Preoperative mobility					
Independent	42	43.3.%	51	50.0%	0.610
Stick	23	23.7%	26	25.5%	
Frame	32	32.0%	24	23.5%	
Non-mobile	1	1.0%	1	1.0%	
ASA					
1	5	5.2%	1	1.0%	0.222
2	16	16.5%	13	12.7%	
3	49	50.5%	62	60.8%	
4	27	27.8%	26	25.5%	
AMTS	Mean 7 (0–10), Median 9		Mean 7 (0–10), Median 9		0.638
Clinical Frailty Scale					
1	4	4.1%	1	1.0%	0.459
2	4	4.1%	4	3.9%	
3	15	15.5%	17	16.7%	
4	25	25.8%	17	16.7%	
5	17	17.5%	23	22.5%	
6	20	20.6%	19	18.6%	
7	11	11.3%	19	18.6%	
8	0	0%	0	0%	
9	1	1.0%	2	2.0%	
Fracture classification					
A1/A2	29	29.9%	29	28.4%	0.466
A3	12	12.4%	11	10.8%	
Intracapsular undisplaced	5	5.2%	13	12.7%	
Intracapsular displaced	45	46.4%	44	43.1%	
Subtrochanteric	8	6.2%	5	4.9%	
Type of operation					
Cemented hemiarthroplasty	25	25.8%	25	24.5%	0.817
Uncemented hemiarthroplasty	9	9.3%	15	14.7%	
DHS	40	41.2%	40	39.2%	
IM nail	7	7.2%	9	8.8%	
THA	9	9.3%	6	5.9%	
Conservative treatment	7	7.2%	7	6.9%	
Time to theatre (h)	Mean 41.7 (12–192)		Mean 25.5 (2–255)		**0.002**
Length of stay (days)	Mean 18.1 (3–52)		Mean 12.3 (2–36)		**<0.001**
Morbidity (30-days)	43	44.3%	39	38.2%	0.383
Mortality (30-days)	8	8.2%	8	7.8%	0.917
COVID-19 positive	0	0	11	10.8%	**0.001**

p-value of less than 0.05 was considered significant.

explain the significant difference between the groups. Furthermore, mortality was found to be associated with male gender ($p = 0.005$), in the Case group. There were 4 dead males and 4 dead females, yet the female group was 4 times larger than the male group. The association of gender is believed to be due to the significant disparity of sex in the case group, and it is believed to be random. Although, a recent published meta-analysis of characteristics for the disease, identified that COVID-19 was more commonly identified in males, rather than females.[17] Our Case group had a high female proportion (84.3%), which could explain the low number (10.8%) of COVID-19 positive patients. Furthermore, mortality was associated with right side ($p = 0.031$) accounting for 6 out of 8 dead patients in our Case group. Again, due to the low numbers noted, this is believed to be a coincidence.

The mean time from admission to theatre was 25.5 h (2–255 h) and the mean length of stay was 12.3 days (2–36 days) in the Case group. Both were significantly less than from the Control group. In our hospital, trauma theatres were available 24 h a day and were led by a consultant trauma and orthopaedic surgeon and anaesthetist. This led to early decision making and surgery for these patients. The change to 24 h operating helped accommodate the shift in theatre availability and need for medical beds for COVID-19 positive patients. Hip fracture patients with a negative COVID-19 test were transferred to a secure 'COVID-19-Negative' ward, in our elective site, which was located outside of the main hospital, and therefore away from COVID-19 positive patients. At 30 days post operatively, only 2 (2.0%) patients were still inpatients and awaiting rehab placements. A systematic review identified that operative delay of more than 48 h was associated with a higher 30 day mortality for hip fractures.[18] More specifically, Nyholm et al. identified that an operative delay of more than 12 h was associated with more patients dying at 30 days, in his study of over 3500 hip fractures.[19] There were 4 patients who waited over 48 h before surgery. The majority of hip fractures awaiting an operation were operated within 24 h of radiological diagnosis. Out of the 4 delayed for surgery (over 48 h), 3 were COVID-19 positive and 1 had a trial of conservative treatment, which failed and required operative intervention. The 3 COVID-19 positive patients had significant delays due to medical optimisation prior to surgery, with multiple medical and anaesthetic reviews, prior to being deemed suitable for operative treatment. Our conservatively treated groups were similar (7.2% vs 6.9%) between Control and Case groups. Handoll et al. demonstrated no difference in medical complications, mortality and long term pain between operated and conservatively treated extra-capsular hip fractures. Surgery did show a higher rate of healing, shorter stay and higher chance of return to normal residence.[20]

Although the period of our analysis was under lockdown rules,[12] the number of hip fractures was similar to the control group (97 vs 102). In contrast, Luceri et al. demonstrated an increase in fragility fractures.[21] This has shown that fragility hip fractures remain to be a major subject for the trauma workload, even during a pandemic and that good management is of paramount importance. Fragility fractures are older individuals with multiple comorbidities, that will be affected more adversely by COVID-19 due to their decreased functional reserves and weakened immune systems.[22] Cipollaro et al. demonstrated a correlation between musculoskeletal conditions (myalgia, arthralgia) and COVID-19, but urged for further studies as the association is poorly understood.[23] The mean age of our Case group was 82.3 years old (60–100 years). The pandemic will adversely affect this demographic and prompt management, with early surgical intervention wherever possible, or appropriate optimisation of their COVID-19 condition and then surgery are vital for survival.

The 30 day mortality rate was 8.2% for the Control group and 7.8% for the Case group ($p = 0.917$). In the Case group, there were 11 (10.8%) COVID-19 positive, with only 1 being treated conservatively and still alive. The other 10 COVID-19 positive patients were treated operatively and 3 had died at 30 days. This demonstrates that COVID-19 has a higher 30 day mortality from conventional fragility hip fractures.[11] Furthermore in the United Kingdom, to date, London has seen the largest mortality rate associated with COVID-19, whereas the West Midlands has the 3rd highest amount of deaths.[24] Careful selection to theatre for COVID-19 fragility hip fractures is advocated. Furthermore, the effect of COVID-19 and fragility hip fractures should be investigated in areas of higher COVID-19 prevalence, as to confirm or re-enforce our observations.

The limitations of our study include the fact that it is a retrospective study. The number of COVID-19 positive patients is small. Furthermore, larger studies are required to solidify the effect of COVID-19 in fragility fractures. Finally, infected patients could exist without significant symptoms, or test inaccuracy, the correct amount of COVID-19 positive patients may be underestimated.[2]

Conclusion

In conclusion, we present our case control study of fragility hip fractures. Significance between groups was identified for time taken between admission and theatre ($p = 0.002$), length of stay ($p < 0.001$) and COVID-19 status ($p = 0.001$). Significantly less time between admission and theatre, and reduced length of stay suggests that service changes helped in the Case group, maintaining a similar 30 day mortality with the Control group. Early surgical intervention is advocated in COVID-19 negative patients. Wherever that is not possible, sufficient optimisation is prudent prior to surgical intervention. The creation of a 'COVID-19-Negative' ward for rehabilitation purposes will help to improve management in this group of patients. Further studies are necessary to further understand the effect of this pandemic for trauma and orthopaedics.

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