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LUÍS DUARTE ALEXANDRE OLIVEIRA

***THE IMPACT OF COVID-19 ON HIP FRACTURES' TREATMENT,
MORTALITY AND MORBIDITY***

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PROFESSOR DOUTOR FERNANDO FONSECA
DR. JOÃO PEDRO MOREIRA DE OLIVEIRA

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THE IMPACT OF COVID-19 ON HIP FRACTURES' TREATMENT, MORTALITY AND MORBIDITY

Artigo de Revisão Narrativa

Luís Duarte Alexandre Oliveira¹, João Pedro Moreira de Oliveira^{1,2}, Fernando Fonseca^{1,2}

¹Faculdade de Medicina, Universidade de Coimbra, Portugal

²Serviço de Ortopedia do Centro Hospitalar e Universitário de Coimbra, Portugal

Contacto: luis_oliveira_97@hotmail.com

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RESUMO:

Introdução: A infecção por SARS-CoV-2 tem-se espalhado rapidamente por todo o mundo, fazendo com que diversos serviços, incluindo os serviços de Ortopedia, se tivessem de adaptar rapidamente de modo a que doentes urgentes, como aqueles com fraturas da extremidade proximal do fêmur, continuassem a ser tratados. A morbidade nestes doentes, tipicamente mais velhos e com diversas patologias costuma ser alta, no entanto sabe-se que uma rápida intervenção cirúrgica, nas primeiras 48h, é um dos aspetos fundamentais para que tenham um prognóstico mais favorável. Esta revisão pretendeu avaliar o efeito que a pandemia de SARS-CoV-2 teve nestes doentes, principalmente no que toca a atrasos até às suas cirurgias, taxas de mortalidade e morbidade.

Materiais e Métodos: Foi feita uma pesquisa bibliográfica em diferentes bases de pesquisa, onde foram analisados diversos estudos como artigos originais, meta-análises, revisões sistemáticas e revisões narrativas, focada essencialmente na epidemiologia, mortalidade e morbidade destes doentes durante a pandemia.

Resultados: A incidência variou consoante os estudos, no entanto a prevalência desta patologia aumentou, dentro do grupo das patologias ortopédicas. Vários estudos relataram atrasos nas suas cirurgias, incluindo atrasos maiores que 48h. Foi relatada uma taxa de mortalidade significativamente maior, quando comparado com períodos semelhantes dos anos anteriores.

Discussão: Doentes com fraturas da extremidade proximal do fêmur e infecção concomitante por SARS-CoV-2 tiveram taxas de mortalidade e morbidade maiores, quando comparados com doentes não infetados. Vários estudos sugerem que longos períodos de imobilização, como é o caso de doentes que aguardam cirurgia para a sua fratura da extremidade proximal do fêmur, podem aumentar o risco de infecção e de morte. Para além disso, crê-se que o tratamento cirúrgico em doentes infetados pode contribuir para a estabilização da função pulmonar, e por isso do doente. É por isso fundamental que estes doentes sejam operados atempadamente para que tenham um prognóstico mais favorável, sendo esta hipótese corroborada por diversos estudos que mostraram melhores resultados quando estes doentes foram operados no intervalo das 48h.

Conclusão: Doentes com fraturas da extremidade proximal do fêmur terão de continuar a ser operados, mesmo com as restrições inerentes à pandemia de SARS-CoV-2, que se adivinha duradoura. Dentro do SNS, deverá ser dada especial atenção de modo a que o tempo até à cirurgia não ultrapasse as 48h, com vista à melhoria do prognóstico nestes doentes.

Palavras-chave: Fraturas da Anca; Fraturas Patológicas; COVID-19; Morbimortalidade; Epidemiologia

ABSTRACT:

Introduction: SARS-CoV-2 pandemic has spread rapidly, and Orthopedic departments had to adapt quickly to treat urgent patients, like hip fracture patients. Morbimortality in these patients tend to be high, as they are typically old and frail and early surgical intervention (<48h) is one of the key aspects to improve outcomes. This paper aimed to evaluate if SARS-CoV-2 had an impact in these patients' treatment and if delays to surgery were noted.

Materials and Methods: Research was made in several databases, as costume for narrative reviews. Original articles, meta-analysis, systematic literature reviews and narrative reviews were assessed, focusing primarily on hip fractures patient's epidemiology, mortality and morbidity during the pandemic.

Results: Hip fractures incidence was different among studies, but prevalence increased. Some studies that recorded time to surgery noted delays that were either inside or outside the 48h period. Mortality rates were significantly higher in the periods studied.

Discussion: Concomitant SARS-CoV-2 infection and hip fracture was associated with increased mortality and complications rate. Studies suggest that immobilization and longer hospitalization periods might increase the chance of infection, so timely performed surgery should be considered in every patient, even in those infected, giving the fact that surgery contributes to stabilization of these patients. Most studies that respected the 48h time-to-surgery rule got better outcomes.

Conclusion: Covid-19 will be a long-lasting reality, especially in older and frailer populations like hip fracture patients. In order to improve outcomes in these patients, hospitals should focus on finding ways to perform surgeries within the first 48h.

Keywords: Hip fractures; COVID-19; Mortality; Morbidity; Epidemiology

ABBREVIATIONS AND ACRONYMS

AAHKS: American Association of Hip and Knee Surgeons

ACS: American College of Surgeons

AMP: Ata Médica Portuguesa

ASA: American Society of Anesthesiology

BOA: British Orthopedic Association

COVID-19: Coronavirus Disease 19

DGS: Direção Geral de Saúde

EHS: European Hip Society

ESSKA: European Society of Sports Traumatology, Knee Surgery & Arthroscopy

NHF: Nottingham Hip Fracture

PCR: Polymerase Chain Reaction

SARS-CoV-2: Severe Acute Respiratory Syndrome-Coronavirus-2

TJA: Total Joint Arthroplasty

WHO: World Health Organization

1.INTRODUCTION:

The SARS-CoV-2 outbreak has caused a huge disruption all around the world when it comes to health-care system. Hospitals needed to rearrange fast as numbers of infections were increasing exponentially day by day. By the 31st of March, there were 129 317 945 confirmed cases and 2 821 367 global deaths directly related to SARS-CoV-2 infection ⁽¹⁾ and the elderly are clearly the most affected group, with mortality rates ranging from 8-24,4% in patients with 70-79 years and from 14,8-26,6% in the ≥80 years group.⁽²⁻⁴⁾ But SARS-CoV-2 infections are not the only responsible for the excess mortality. Cardoso J. et al⁽⁵⁾ found an unexpected mortality rate during March and April that were not explained by SARS-CoV-2 infections in all the five European countries they've studied. Other study, conducted by Nogueira P. et al ⁽⁶⁾ and regarding the Portuguese population estimated that during March and April of 2020, an excess mortality of 2400 to 4000 people has occurred and that this increase is three to five times higher than what SARS-CoV-2 fatalities would explain during the same period. In both studies the elderly was the most affected.

Being able to treat infected patients and control the spread of SARS-CoV-2 has been the main focus of most countries around the world, leading to a disruption in most medical departments, as for the Orthopedics department.⁽⁷⁾ Because of that and in order to reduce possible spreading, both the American College of Surgeons (ACS) and the European Society of Sports Traumatology, Knee Surgery & Arthroscopy (ESSKA) review their guidelines to ensure that emergent/urgent patients were still being surgically treated.^(8,9)

One of the most prevalent group of pathologies in the older ones (≥65 years) are the hip fractures, accounting for 50% of Orthopedics hospitalizations in this age group.^(10,11) In a study published in 2018, Silva J. et al. studied the geriatric Portuguese population and the incidence of proximal femoral fractures between 2005 and 2013. The incidence in this group was reported to be 597 fractures/year/100.000 people and the tendency was increasing over the years, which might be explained due to the increased life expectancy and ageing of the population. The incidence pattern of this type of fractures comes along with international estimates, where authors expect a total of up to 6,26 million proximal femoral fractures by 2050.^(10,12,13)

The literature shows us that morbimortality of this type of fractures is still a problem and cannot be ruled out. Whereas it depends on the type of population studied, it is believed that mortality can range from 9-13% in the first 30 days and from 14-36% within the 1st year, even with optimal care⁽¹⁴⁻¹⁷⁾ and most studies show us that this percentage can increase with surgery delay.^(14,17-24) Some of them go further and found out a cumulative 13% chance of dying for each day of delay.⁽¹⁹⁾ Although a cut off is still a theme for discussion, there seems to be enough information among different studies that demonstrate that time to surgery mustn't

exceed the 48h period.^(17,19,21,23–28) As we can see in Lewis P. and Waddell J.⁽¹⁹⁾, some authors have reported no death increase beyond these limits, but major complications have doubled, as for other studies where an increase in complications is shown, contributing to a bigger morbidity in these patients.^(14,17)

This paper aimed to review existing literature regarding hip fractures incidence, mortality and morbidity in patients over 65 years old and the possible impact that the SARS-CoV-2 pandemic and associated surgery delay might cause.

2.MATERIALS AND METHODS:

Research methods were made as for narrative reviews. We focused our analysis on studies regarding SARS-CoV-2 pandemic and the impact on the Orthopedic departments, especially patients suffering from hip fractures. We analyzed the epidemiology of this patients, as well as the mortality and morbidity of this condition. We tried to look for a relation between delayed surgeries and the impact of delayed surgery in these patients, in “Covid times” as well as “Pre-Covid times”. Changes in mortality rates and complications during the pandemic and its relationship with infection were also assessed. We focused primarily on patients with 65 years or more, since both incidence, mortality and morbidity is more significant in this population. We analyzed different papers, including meta-analysis, systematic literature reviews, original articles, clinical cross-sectional case-control studies, cohort studies and dissertations.

Research work was done during the period of September to December 2020 using PubMed®, Google Scholar™, Direção Geral de Saúde (DGS) website and Ata Médica Portuguesa (AMP) website in order to meet the Portuguese reality and compare it with the international reality that was found in most PubMed® papers.

The MeSH terms used were the following: “Hip fractures, Covid-19, Epidemiology, Mortality, Morbidity” and the purpose was to find papers where these search terms were used, either in the title, abstract, keywords or content: *“Hip fractures”[All fields] AND “COVID-19”[All fields], (“Hip Fractures/epidemiology”[Mesh]) AND “COVID-19”[Mesh], (“Hip Fractures/complications”[Mesh]) AND “COVID-19”[Mesh], (“Hip Fractures”[Mesh]) AND “COVID-19”[Mesh].*

Since the pandemic only started to affect most countries in 2020, the large majority of articles was from this year, except for some references and some data found in DGS and AMP.

Duplicate articles were excluded.

In addition, a review of the various bibliographical references of the works that were selected in the first phase of research was conducted.

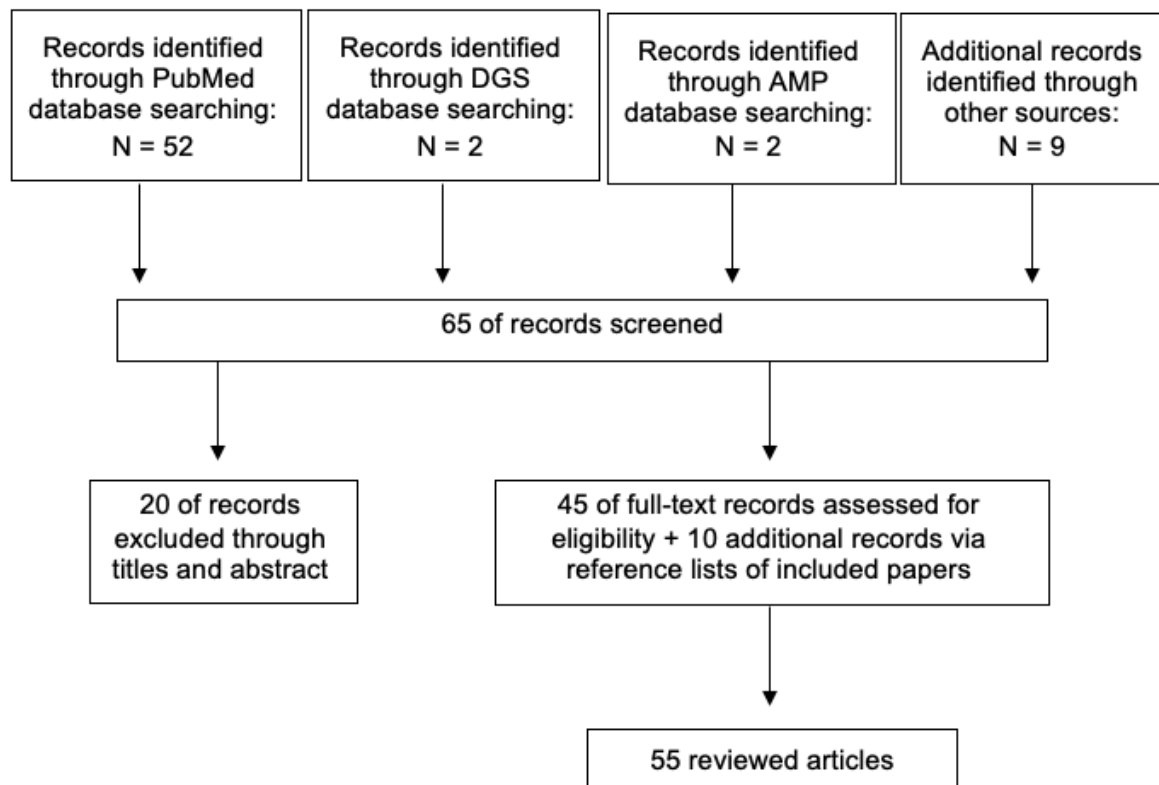


Figure 1. Flow diagram showing the search strategy and selection of revised records

3. RESULTS:

3.1 Clinical Guides

At the beginning of the pandemic, it was not easy to establish a clear division between elective and nonelective procedures and especially what concerns trauma patients.^(8,29,30)

The Ohio Hospital Association tried to establish some criteria where these surgeries shouldn't be delayed: "Threat to the patient's life if surgery or procedure is not performed, threat of permanent dysfunction of an extremity or organ system, (...) risk of rapidly worsening to severe symptoms".⁽⁸⁾ The ACS stratified different pathologies by level of urgency, from 1 to 3. Hip and femoral fractures were included in tier 3 and considered "urgent", meaning that surgical approach should occur in the first two days.⁽³¹⁾

In the specific case of fragility fractures, British Orthopedic Association (BOA) released a clinical guide suggesting that patients that were asymptomatic, not self-isolating or didn't have a contact with a positive case should all be treated. They go further, suggesting that swab testing and suspected or confirmed infection can't be a reason for surgery delay.⁽³²⁾ This clinical guide was released two weeks after World Health Organization (WHO) declared SARS-CoV-2 and Covid-19 a world pandemic.⁽³³⁾

More recent clinical guides suggest that testing for SARS-CoV-2 by Polymerase Chain Reaction (PCR) should be done either in the Emergency Department or when admitting a surgical trauma/orthopedic patient in a ward and that results from testing can have an impact on surgical timing.^(26,29,34)

3.2 Hip fractures

3.2.1 Incidence

It is clear that the number of fractures decreased substantially in many countries during lockdown periods, but this relation is not as clear as for hip fractures. The BOA first predicted that hip fractures incidence wouldn't decrease.⁽³²⁾ Most studies conducted in different parts of the globe reported no change in fragility/osteoporotic hip fractures numbers at their centers^(22,26,35-39), with Yu P. et al reporting an unusually higher admission of hip fractures at their center during the pandemic⁽²⁵⁾, as for Arafa M. et al, that reported a 61,7% increase in hip fractures during UK lockdown.⁽⁴⁰⁾

But some studies also show a decrease in hip fracture admissions during the first months of the pandemic, with values ranging from -24,1 to 32,2% in Italy during February and March⁽⁴¹⁾, -21% but an increased prevalence during March-May⁽⁴²⁾ and a -26% admission during the Spanish lockdown period in a hospital in Madrid.⁽⁴³⁾

3.2.2 Response

A survey conducted by the AAHKS (American Association of Hip and Knee Surgeons) between 8-13th April and where 99 surgeons from 32 different countries responded found that 14% have cancelled all types of surgeries and 71% were forced to delay primary TJA (total joint arthroplasty) – elective and nonelective procedures – but patients with fractures were still being treated surgically.⁽⁴⁴⁾

Another survey by the EHS (European Hip Society) and the European Knee Associates, in a similar period and where 217 EHS from 40 countries participated, showed that 84.8% were still performing total/hemi-arthroplasty for femoral neck fractures and only 7,8% of these procedures were delayed or didn't happen.⁽⁷⁾

3.2.3 Time to Surgery

Time to surgery differ depending on the population studied and how hospitals were organized. Reports from Shanghai between 24th of January and 9th of March showed that average time to surgery increased from 2 to 4.5 days, when comparing with the previous year.⁽²⁵⁾ In a massive Spanish study that included 13 trauma centers, the average time from presentation to surgery was found to be 2.4 days, with values ranging from 0 to 13 days.⁽³⁰⁾ A study conducted at 9 London institutes between the 1st of February and the 20th of April reported a >72h time to surgery in all of their patients.⁽¹⁴⁾

Other studies revealed that only Covid-19 + patients had their surgeries delayed: Egol K. et al⁽²²⁾ showed that Covid-19 + patients had a significant increase in terms of time to surgery (2.7 ± 3.9 days vs 1.1 ± 0.6 in Covid -) as well as Chui K. et al⁽³⁷⁾ in an orthopedic service in Romford, UK (Mean time: 52.8 hours vs. 29.8, $p = 0,0146$)

Multiple studies showed that there was a delay, when looking at 2019, but numbers were still included in the 48h window.^(26,40,45)

In the specific case of Portugal, we collected data from the Portuguese National Health System regarding the number of patients with 65 years or more, that had a hip fracture diagnostic and underwent surgery (Fig. 2) and those who had surgery in the first 48h (Fig. 3), between 2015 and 2020. There was a significant decrease in terms of surgeries performed in 2020, around 21-29%, when comparing to the previous years. The surgeries performed within 48h followed a similar pattern, with a 22-25% decrease. In 2020, the relation between surgeries performed within 48h/surgeries performed was 47,3%.⁽⁴⁶⁾

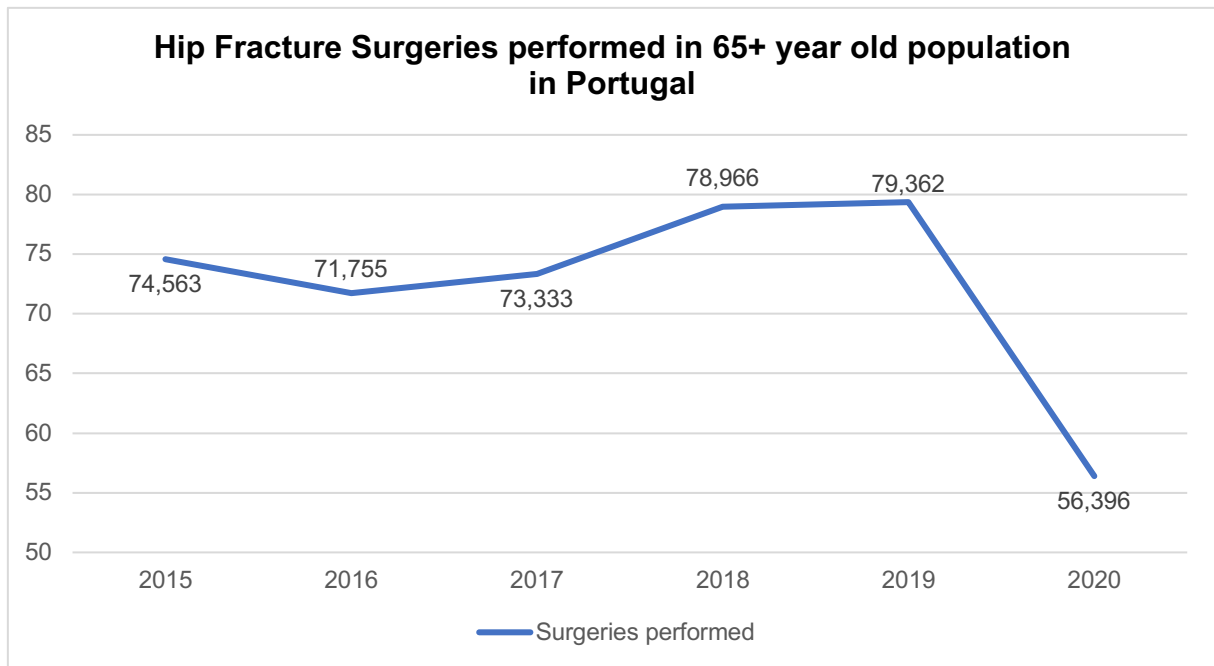


Figure 2: Hip Fracture Surgeries performed in 65+ year old population in Portugal.

Adapted from: <https://transparencia.sns.gov.pt/>

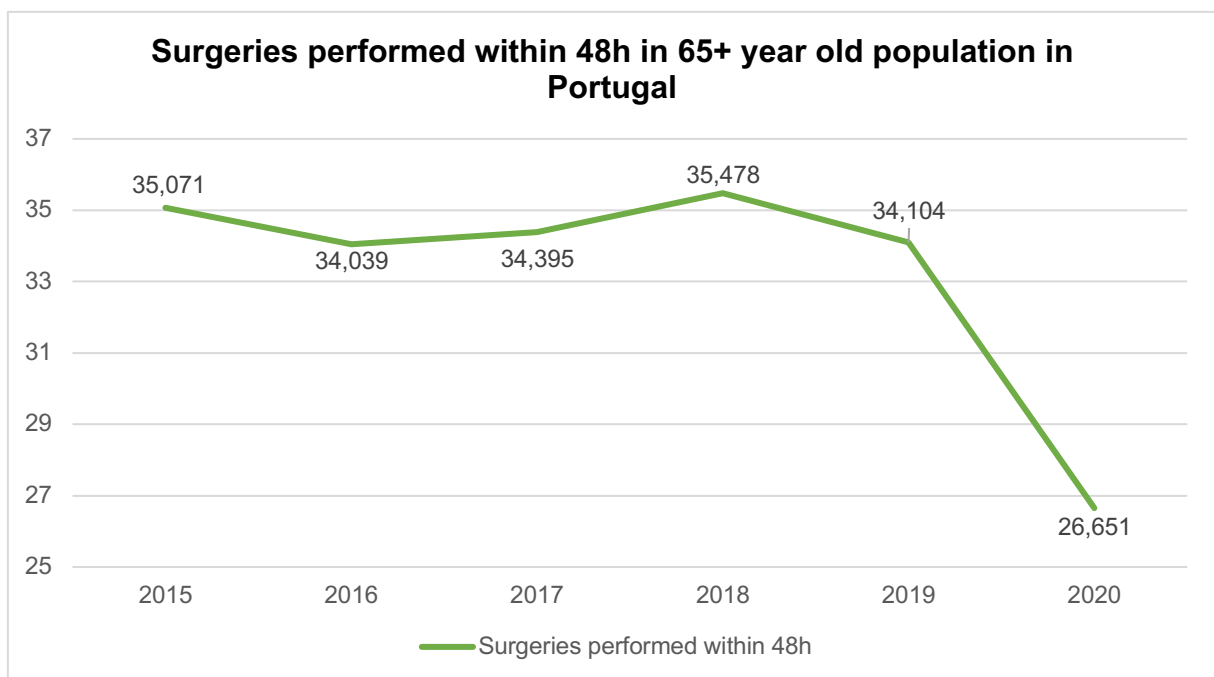


Figure 3: Hip fracture surgeries performed within 48h in 65+ year old population, in Portugal.

Adapted from: <https://transparencia.sns.gov.pt/>

3.2.4 Mortality rates and morbidity

Regarding mortality and morbidity among hip fracture patients, 13 studies were analyzed. Main results are shown in Table 1.

Table 1: Hip fractures' mortality and morbidity patterns during Covid-19 outbreak.

Study	Timeframe	Population	Mortality	Complications	Notes
Slullitel P. et al (45)	December 2019 – May 2020	“pre-Covid time” (PCT): 86 “Covid time”(CT): 74	<u>30 days:</u> (PCT → CT) 0% → 10,8%	Increased thromboembolic events	CT patients: frailer and less active. <u>All tested, all negative.</u>
Mi B. et al (47)	1 st January- 20 th July	Total: 145 108 delayed surgery (DS) 37 conservative (C)	<u>3 months:</u> C: 12% DS: 1%	<u>Deep venous thrombosis:</u> DS: 10% 1 month and 13,1% at 3 months C: 24% and 35,3% <u>Respiratory infections:</u> DS: 15,2% at 3 months C: 47,1%	Similar populations. <u>All tested, all negative.</u> Exclusion criteria: Hip fractures within 21 days.
Kayani B. et al ⁽¹⁴⁾	1 st February- 20 th April	422: 82 Covid + 340 Covid -	<u>30 days:</u> 14,2% (total) Covid +: 30,5% Covid -: 10,3%	* Covid +: 89% Covid -: 35%	Time to surgery >72h. Similar populations. <u>All patients tested at admission</u>
Mackay N. et al (48)	23 rd March- 23 rd April	166 trauma patients	<u>30 days:</u> (2019→2020) 7% → 18,2%		<u>All patients tested.</u>
Chui K. et al ⁽³⁷⁾	31 st March (30-day period)	47: 12 Covid + 35 Covid -	Total: 10,3% Not statistically significant, but 4/5 deaths were Covid + Mean: 24.7 days		No Covid + in “Covid-free” site. “Covid” site: + institutionalized patients <u>Patients tested.</u>

Study	Timeframe	Population	Mortality	Complications	Notes
Núñez J. et al ⁽³⁹⁾	4 different periods, pre- and post-emergency state was declared and corresponding periods in 2018 and 2019		<u>Intra-hospitalar:</u> No statistic-significant changes		Similar populations. > 15 years <u>All patients tested at admission.</u>
Arafa M. et al ⁽⁴⁰⁾	March-May	2019: 60 2020: 97	<u>30 days:</u> (2019→2020) 11,7% → 14,4%	Increased inpatient falls	2020 mortality: Covid -: 11,5% Covid +: 36,8% Similar populations. Assumed that all patients were positive – single theatre pathway.
Vives J. et al ⁽³⁰⁾	14 th March - 4 th April	Total: 136 124 surgical 12 non-surgical	<u>Total:</u> 9,6% <u>Surgical:</u> 4% <u>Non-surgical:</u> 67% Mean: 14 days		13 Covid +, 7 deaths (54%). Nursing home patients were more prone to get Covid-19 and die. Patients tested if high suspicion of infection.
Segarra B. et al ⁽²⁶⁾	1 st February- 15 th April	2019: 70 2020: 68	<u>30 days:</u> (2019→2020) 12,9% → 11,8%	Similar to previous year	Similar populations. Patients tested if high suspicion of infection.
Egol K. et al ⁽²²⁾	1 st February- 15 th April	2019: 115 2020: 138	<u>Inpatient:</u> (2019→2020) 0,9% → 5,8% <u>30 days:</u> (2019→2020) 2,7% → 12,3%	<u>Major complications:</u> ** 8,7% → 20,3%	Similar populations. Covid + mortality: 53% Not all patients were tested.

Study	Timeframe	Population	Mortality	Complications	Notes
Macey A. et al ⁽⁴⁹⁾	5-week period starting at the 20 th of March	2019: 76 2020: 79	<u>30 days:</u> (2019→2020) 13% → 14%	No significant increase in pulmonary complications	10 Covid+ and 2 deaths (20%). Similar populations. Not all patients were tested.
Maniscalco P. et al ⁽⁴¹⁾	22 nd February- 18 th April	2019: 169 2020: 121	<u>21 days:</u> (2019→2020) 4,4% → 18% (Piacenza) 2,5% → 10% (Parma)	Complications have increased.	Not all patients were tested.
Lim M. et al ⁽⁵⁰⁾	"Inception" – 13 th July 2020	6 studies with a total of 984 patients -Surgical: 739 -Non-specified/conservative: 245	<u>Surgically treated:</u> Covid +: 28% Covid -: 10,3% <u>Total:</u> Covid +: 36% Covid -: 2%	Increased in the Covid + groups.	Systematic review and meta-analysis.

*: Respiratory infection, acute kidney disease, septic shock, myocardial infarction, thromboembolic disease, acute respiratory distress syndrome, multiorgan dysfunction, severe metabolic acidosis, coagulation dysfunction

**: acute renal failure, surgical site infection, urinary tract infection, acute anemia, sepsis, pneumonia, deep vein thrombosis/pulmonary embolus (DVT/PE), acute myocardial infarction, stroke, acute postoperative, infection, decubitus ulcer, acute respiratory failure, cardiac arrest, and death

4. DISCUSSION:

Summary of main results ascertain that Covid-19 pandemic had a significant effect on hip fracture patients, from short-term mortality/morbidity to time to surgery.

Early surgery is fundamental in hip fracture patients and even more during the pandemic. Prevalence of Covid-19 among hip fracture patients can be 23 times higher, when comparing with the general population, as seen in Clement N. et al.⁽⁵¹⁾ The elderly is already a frailer population and it's known that airway clearance of either small or large airways is compromised due to their physiologically deficient response⁽⁵²⁾ and immobilization per se might have a bigger impact in physiological responses, including immune response, than the fracture itself⁽²³⁾. In a large study with 26 051 patients⁽²⁸⁾ and a systematic review that included 13 478 patients, it was shown that a delay of 24-48h to surgery increases pulmonary complications such as pneumonia^(28,53,54), enhancing the idea that these patients should be treated as fast as possible.

Association between Covid + patients and increased mortality and morbidity was found in the majority of the represented studies^(14,30,37,40,41,50), reinforcing that infection is a risk factor for these patients. In a meta-analysis conducted by Lim M. et al⁽⁵⁰⁾ they found out a seven-time increased risk of mortality in patients with concomitant Covid-19 + and hip fracture, when comparing with Covid-19 - patients. But in the case of three studies, these numbers haven't increase. In Macey et al⁽⁴⁹⁾, similar mortality rates were noted when comparing the same period in 2019 (13% vs 14%), as for pulmonary complications, where the slight increase was not statistically relevant. It is important to note that time to surgery did not increase during the pandemic period, emphasizing that early surgical intervention might be critical in order to get better outcomes in these patients. Similar results were found in Segarra B. et al⁽²⁶⁾, where mortality numbers didn't increase and even though time to surgery increased, it didn't go past the 48h period (1.5 vs 1.8 days).

On the other hand, the Spanish HIP-COVID Study⁽³⁰⁾ collected data from 13 major hospitals and found out a mortality rate of 9.6% at 14 days and an average delay to surgery of 2.4 days. Even though direct correlation can't be done with the studies above, the HIP study shows poorer outcomes, with 14-days mortality similar to those expected at 30 days.^(14,17,19)

In other study, conducted by Arafa M. et al⁽⁴⁰⁾, the mean time to surgery was around 24h and it was similar between 2019, 2020 positive and 2020 negative patients. Despite these efforts, Covid-19 + patients had significant higher mortality rates at 30 days (36.8%). Similar results were also recorded in Italy⁽⁴¹⁾, where the amount of timely performed surgeries increased, but they've seen their mortality rates go up as well.

Other reason to believe that surgeries should be performed as fast as possible during

this pandemic is the fact that longer hospital stays might increase the risk of nosocomial infection. Kayani et al⁽¹⁴⁾ evaluated the outcomes of 422 patients that received delayed surgical treatment (>72). Prevalence of Covid + patients was about 20% and researchers believe that half of their patients contracted the infection during their hospital stay. Other studies corroborate the fact that patients might get the infection during hospital stay.^(39,48)

Addressing Covid-19 + patients, it is difficult to establish if the main reason for poorer clinical outcomes was the infection itself, as there can be a lot of confounding factors. It is clear that infection represents a major risk factor, but when analyzing this population, we can see that in some studies Covid + patients tend to be frailer, older and have higher American Society of Anesthesiology (ASA) and Nottingham Hip Fracture (NHF) scores^(30,37,45,50). Nonetheless, these patients still require treatment for their fractures and surgical treatment can contribute to overall stabilization and prognosis of this patients. Catellani et al⁽⁵⁵⁾ studied 13 patients who were Covid-19 + and underwent surgery and they observed an improvement of respiratory functions in 12. In a systematic review conducted by Guerado E. et al⁽⁵⁴⁾ they concluded that unless these patients presented with a major deterioration of their clinical condition, they should still be treated surgically, and that infection is not a criterion itself to either delay or cancel surgery. This is consistent with other articles, like the one of Yu P. et al⁽²⁵⁾ where they suggest that patients with stable pneumonia should undergo surgery rather than conservative treatment, which is known to have worst outcomes in these patients⁽⁴⁷⁾, or Vives J. et al⁽³⁰⁾ that also suggested that Covid-19 + patients benefit from early surgical treatment.

It is important to say that most studies refer to the first Covid-19 outbreak and less was known about the virus. Since SARS-CoV-2 pandemic is recent, only short-term outcomes were measured. We believe that with further research, optimized medical care, like early surgical treatment, establishing hospital pathways – as seen in some studies^(18,37) – and testing of all patients prior to admission will improve hip fracture patients outcomes in the future.

5. CONCLUSION:

Outcomes of hip fracture patients were clearly affected by the pandemic. Whether incidence decreased in some countries during the first months of the pandemic, a lot is yet to do in terms of giving the best treatment possible to these patients.

Giving the fact that SARS-CoV-2 infection increases mortality and morbidity, hip fractures should be treated promptly, as it improves outcomes and minimizes intrahospital stay and immobilization, which are known risk factors for infection and thromboembolic complications.

In order to achieve these goals, special attention should be given by hospital administrations to create fast pathways and allowing these patients to have their surgeries within the first 48h.

6. REFERENCES:

1. Coronavirus.jhu.edu [homepage on the Internet]. Baltimore: Johns Hopkins University Center for Systems Science and Engineering (JHCSSE); Coronavirus COVID-19 (2019-nCoV) Data Repository; [accessed 2021 March 31]. Available at: <https://coronavirus.jhu.edu/map.html>
2. Kang S-J, Jung SI. Age-Related Morbidity and Mortality among Patients with COVID-19. *Infect Chemother*. 2020;52(2):154.
3. The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) - China, 2020. *China CDC Weekly* 2020;2:113-22. [accessed 2021 Jan 3]. Available at: <https://pesquisa.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/en/czh-933>
4. Task force COVID-19 del Dipartimento Malattie Infettive e Servizio di Informatica, Istituto Superiore di Sanità. *Epidemia COVID-19, Aggiornamento nazionale: 30 marzo 2020*. [accessed 2020 Dec 17]. Available at: https://www.epicentro.iss.it/coronavirus/bollettino/Bollettino-sorveglianza-integrata-COVID-19_2-aprile-2020.pdf.
5. Félix-Cardoso J, Vasconcelos H, Pereira Rodrigues P, Cruz-Correia R. Excess mortality during COVID-19 in five European countries and a critique of mortality analysis data [dissertation]. Repositório Aberto Universidade do Porto; 2020. Available at: <https://hdl.handle.net/10216/128804>
6. Nogueira PJ, De Araújo Nobre M, Nicola PJ, Furtado C, Vaz Carneiro A. Excess Mortality Estimation During the COVID-19 Pandemic: Preliminary Data from Portugal. *Acta Med Port*. 2020;33(6):376.
7. Thaler M, Khosravi I, Hirschmann MT, Kort NP, Zagra L, Epinette JA, et al. Disruption of joint arthroplasty services in Europe during the COVID-19 pandemic: an online survey within the European Hip Society (EHS) and the European Knee Associates (EKA). *Knee Surgery, Sport Traumatol Arthrosc*. 2020;28(6):1712–9.
8. Sarac NJ, Sarac BA, Schoenbrunner AR, Janis JE, Harrison RK, Phieffer LS, et al. A Review of State Guidelines for Elective Orthopaedic Procedures During the COVID-19 Outbreak. *J Bone Jt Surg*. 2020;102(11):942–5.
9. Mouton C, Hirschmann MT, Ollivier M, Seil R, Menetrey J. COVID-19 - ESSKA guidelines and recommendations for resuming elective surgery. *J Exp Orthop*. 2020;7(1):28.
10. Silva J, Linhares D, Ferreira M, Amorim N, Neves N, Pinto R. Tendências

Epidemiológicas das Fraturas do Fémur Proximal na População Idosa em Portugal. *Acta Med Port.* 2018;31(10):562.

11. Vanhaecht K, Sermeus W, Peers J, Lodewijckx C, Deneckere S, Leigheb F, et al. The impact of care pathways for patients with proximal femur fracture: rationale and design of a cluster-randomized controlled trial. *BMC Health Serv Res.* 2012;12(1):124.
12. Laires PA, Perelman J, Consciência JG, Monteiro J, Branco JC. [Epidemiology of hip fractures and its social and economic impact. An update for 2014]. *Acta Reumatol Port.* 2015;40(3):223–30.
13. Gullberg B, Johnell O, Kanis JA. World-wide Projections for Hip Fracture. *Osteoporos Int.* 1997;7(5):407–13.
14. Kayani B, Onochie E, Patil V, Begum F, Cuthbert R, Ferguson D, et al. The effects of COVID-19 on perioperative morbidity and mortality in patients with hip fractures. *Bone Joint J.* 2020;102-B(9):1136–45.
15. Hu F, Jiang C, Shen J, Tang P, Wang Y. Preoperative predictors for mortality following hip fracture surgery: A systematic review and meta-analysis. *Injury.* 2012;43(6):676–85.
16. Panula J, Pihlajamäki H, Mattila VM, Jaatinen P, Vahlberg T, Aarnio P, et al. Mortality and cause of death in hip fracture patients aged 65 or older - a population-based study. *BMC Musculoskelet Disord.* 2011;12(1):105.
17. Chen P, Shen X, Xu W, Yao W, Ma N. Comparative assessment of early versus delayed surgery to treat proximal femoral fractures in elderly patients: A systematic review and meta-analysis. *Int J Surg.* 2019;68(999):63–71.
18. Liu J, Mi B, Hu L, Xiong Y, Xue H, Zhou W, et al. Preventive strategy for the clinical treatment of hip fractures in the elderly during the COVID-19 outbreak: Wuhan's experience. *Aging (Albany NY).* 2020;12(9):7619–25.
19. Lewis PM, Waddell JP. When is the ideal time to operate on a patient with a fracture of the hip? *Bone Joint J.* 2016;98-B(12):1573–81.
20. Khan H, Khorati A, Lazic S, Navein J, Sharma R, Ellahee N. The effect of time to surgery in neck of femur fracture patients with ASA Grade of 3 and above. *HIP Int [Internet].* 2020; Available from: <https://journals.sagepub.com/doi/abs/10.1177/1120700020972025>
21. Leer-Salvesen S, Engesæter LB, Dybvik E, Furnes O, Kristensen TB, Gjertsen J-E. Does time from fracture to surgery affect mortality and intraoperative medical complications for hip fracture patients? *Bone Joint J.* 2019;101-B(9):1129–37.
22. Egol KA, Konda SR, Bird ML, Dedhia N, Landes EK, Ranson RA, et al. Increased Mortality and Major Complications in Hip Fracture Care During the COVID-19 Pandemic: A

New York City Perspective. *J Orthop Trauma*. 2020;34(8):395–402.

23. Silveira A, Gonçalves A, Catalão C, Spínola C, Pimentel F, Soares L, et al. Fracturas da extremidade proximal do fémur no idoso: recomendações para intervenção terapêutica. *Direção Geral de Saúde*. 2003. 389–398 p.
24. Rosso F, Dettoni F, Bonasia DE, Olivero F, Mattei L, Bruzzone M, et al. Prognostic factors for mortality after hip fracture: Operation within 48 hours is mandatory. *Injury*. 2016;47:S91–7.
25. Yu P, Wu C, Zhuang C, Ye T, Zhang Y, Liu J, et al. The patterns and management of fracture patients under COVID-19 outbreak in China. *Ann Transl Med*. 2020;8(15):932.
26. Segarra B, Ballesteros Heras N, Viadel Ortiz M, Ribes-Iborra J, Martinez-Macias O, Cuesta-Peredo D. Are Hospitals Safe? A Prospective Study on SARS-CoV-2 Prevalence and Outcome on Surgical Fracture Patients: A Closer Look at Hip Fracture Patients. *J Orthop Trauma*. 2020;34(10):e371–6.
27. Huette P, Abou-Arab O, Djebara A, Terrasi B, Beyls C, Guinot P, et al. Risk factors and mortality of patients undergoing hip fracture surgery: a one-year follow-up study. *Sci Rep*. 2020;10(1):9607.
28. Fu MC, Boddapati V, Gausden EB, Samuel AM, Russell LA, Lane JM. Surgery for a fracture of the hip within 24 hours of admission is independently associated with reduced short-term post-operative complications. *Bone Joint J*. 2017;99-B(9):1216–22.
29. Abdelnasser MK, Morsy M, Osman AE, AbdelKawi AF, Ibrahim MF, Eisa A, et al. COVID-19. An update for orthopedic surgeons. *SICOT J*. 2020; 6(14):9
30. Muñoz Vives JM, Jornet-Gibert M, Cámara-Cabrera J, Esteban PL, Brunet L, Delgado-Flores L, et al. Mortality Rates of Patients with Proximal Femoral Fracture in a Worldwide Pandemic. *J Bone Jt Surg*. 2020;102(13):e69.
31. Anoushiravani AA, Barnes CL, Bosco JA, Bozic KJ, Huddleston JI, Kang JD, et al. Reemergence of Multispecialty Inpatient Elective Orthopaedic Surgery During the COVID-19 Pandemic. *J Bone Jt Surg*. 2020;102(14):e79.
32. Baldwick C, Handley B, Moppett I, Chessier T, Hurford D, Ray D. Clinical guide for the perioperative care of people with fragility fractures during the Coronavirus pandemic. Nhs. 2020;Version BOA1, published for BOA members 24/3/2020 [accessed 2020 Nov 27]. Available from: <https://www.boa.ac.uk/standards-guidance/clinical-guide-for-the-perioperative-care.html>
33. Who.int [homepage on the Internet]. World Health Organization. Coronavirus disease 2019 (COVID-19): Situation Report 51; 2020; [accessed 2020 Dec 17] Available at:

https://who.int/docs/default-source/coronaviruse/situation-reports/20200311-sitrep-51-covid-19.pdf?sfvrsn=1ba62e57_10.

34. Xiong Y, Chen L, Lin Z, Panayi AC, Mi B, Liu G. Orthopaedic Guidelines for the COVID-19 Post-Outbreak Period. *J Bone Jt Surg*. 2020;102(15):e87.
35. Ogliari G, Lunt E, Ong T, Marshall L, Sahota O. The impact of lockdown during the COVID-19 pandemic on osteoporotic fragility fractures: an observational study. *Arch Osteoporos*. 2020;15(1):156.
36. Scott CEH, Holland G, Powell-Bowns MFR, Brennan CM, Gillespie M, Mackenzie SP, et al. Population mobility and adult orthopaedic trauma services during the COVID-19 pandemic: fragility fracture provision remains a priority. *Bone Jt Open*. 2020;1(6):182–9.
37. Chui K, Thakrar A, Shankar S. Evaluating the efficacy of a two-site ('COVID-19' and 'COVID-19-free') trauma and orthopaedic service for the management of hip fractures during the COVID-19 pandemic in the UK. *Bone Jt Open*. 2020;1(6):190–7.
38. Greenhalgh M, Dupley L, Unsworth R, Boden R. Where did all the trauma go? A rapid review of the demands on orthopaedic services at a UK Major Trauma Centre during the COVID-19 pandemic. *Int J Clin Pract*. 2021;75(3):2–6.
39. Nuñez JH, Sallent A, Lakhani K, Guerra-Farfan E, Vidal N, Ekhtiari S, et al. Impact of the COVID-19 Pandemic on an Emergency Traumatology Service: Experience at a Tertiary Trauma Centre in Spain. *Injury*. 2020;51(7):1414–8.
40. Arafa M, Nesar S, Abu-Jabeh H, Jayme MOR, Kalairajah Y. COVID-19 pandemic and hip fractures: impact and lessons learned. *Bone Jt open*. 2020;1(9):530–40.
41. Maniscalco P, Poggiali E, Quattrini F, Ciatti C, Magnacavallo A, Vercelli A, et al. Proximal femur fractures in COVID-19 emergency: the experience of two Orthopedics and Traumatology Departments in the first eight weeks of the Italian epidemic. *Acta Biomed*. 2020;91(2):89–96.
42. Dolci A, Marongiu G, Leinardi L, Lombardo M, Dessì G, Capone A. The Epidemiology of Fractures and Musculo-Skeletal Traumas During COVID-19 Lockdown: A Detailed Survey of 17.591 Patients in a Wide Italian Metropolitan Area. *Geriatr Orthop Surg Rehabil*. 2020;11:1-8.
43. Ojeda-Thies C, Cuarental-García J, Ramos-Pascua LR. Decreased volume of hip fractures observed during COVID-19 lockdown [published online ahead of print, 2021 Jan 22]. *Eur Geriatr Med*. 2021;1-8.
44. Athey AG, Cao L, Okazaki K, Zagra L, Castelli CC, Kendoff DO, et al. Survey of AAHKS International Members on the Impact of COVID-19 on Hip and Knee Arthroplasty Practices. *J*

Arthroplasty. 2020;35(7):S89–94.

45. Slullitel PA, Lucero CM, Soruco ML, Barla JD, Benchimol JA, Boietti BR, et al. Prolonged social lockdown during COVID-19 pandemic and hip fracture epidemiology. *Int Orthop*. 2020;44(10):1887–95.
46. Sns.gov [homepage on the internet]. Lisboa: Serviço Nacional de Saúde (SNS); Portal da transparência; [accessed 2020 Dec 29]. Available from: <https://transparencia.sns.gov.pt/explore/dataset/fraturas-da-anca-cirurgias-nas-primeiras-48h/analyze/?disjunctive.regiao&disjunctive.instituicao&sort=tempo&location=6,39.45581,-8.10354&dataChart=eyJxdWVyaWVzIjpibeyJjaGFydHMiOlt7InR5cGUiOiJsaW5lliwiZnVuYyI6IiNVTSIsInlBeGlzIjoibm9fZXBpc29kaW9zX3V0ZW50ZXNfaWRhZGVfc3VwXzY1X2Fub3NfY29tX2RpYWdfcHJpbmNfODlwX2NvbV9jaXJfcmlvbmVhbGlxX25hc18xYXNfNDhoX2Fwb3NfYWRtaXNzYW8iLCJjb2xvcil6ImM2NmMyYTUiLCJzY2llbnRpZmljRGlzGxheSI6dHJ1ZX1dLCJ4QXhpYyl6InRibXBvIiwibWF4cG9pbnRzIjoiliwidGltZXNjYWxlIjoibW9udGgiLCJzb3J0IjoiliwiY29uZmInIjp7ImRhZGFzZXQiOiJmcmF0dXJhcy1kYS1hbmNhLWNpcnVyZ2lhcy1uYXMtcHJpbWVp cmFzLTQ4aCIsIm9wdGlvdnMiOnsiZGlzanVuY3Rpd mUucmVnaWFvljp0cnVILCJkaXNqdW5jdGlZS5pb nN0aXR1aWNhbyl6dHJ1ZSwic29ydCI6InRibXBvIiwibG9jYXRpb24iOiIl2LDM5LjQ1NTgxLC04LjEwMzU0In19fV0sInRpbWVzY2FsZSI6InllyXliLCJkaXNwbGF5TG VnZW5kljp0c nVILCJhbGlnbk1vbnRojp0cnVlfQ%3D%3D>
47. Mi B, Chen L, Tong D, Panayi AC, Ji F, Guo J, et al. Delayed surgery versus nonoperative treatment for hip fractures in post-COVID-19 arena: a retrospective study of 145 patients. *Acta Orthop*. 2020;91(6):639–43.
48. Mackay ND, Wilding CP, Langley CR, Young J. The impact of COVID-19 on trauma and orthopaedic patients requiring surgery during the peak of the pandemic. *Bone Jt Open*. 2020;1(9):520–9.
49. Macey ARM, Butler J, Martin SC, Tan TY, Leach WJ, Jamal B. 30-day outcomes in hip fracture patients during the COVID-19 pandemic compared to the preceding year. *Bone Jt Open*. 2020;1(7):415–9.
50. Lim MA, Pranata R. Coronavirus disease 2019 (COVID-19) markedly increased mortality in patients with hip fracture – A systematic review and meta-analysis. *J Clin Orthop Trauma*. 2021;12(1):187–93.
51. Clement ND, Ng N, Simpson CJ, Patton RFL, Hall AJ, Simpson AHRW, et al. The prevalence, mortality, and associated risk factors for developing COVID-19 in hip fracture patients: a systematic review and meta-analysis. *Bone Joint Res*. 2020;9(12):873–83.
52. Svartengren M, Falk R, Philipson K. Long-term clearance from small airways decreases with age. *Eur Respir J*. 2005;26(4):609–15.

53. Simunovic N, Devereaux PJ, Sprague S, Guyatt GH, Schemitsch E, DeBeer J, et al. Effect of early surgery after hip fracture on mortality and complications: systematic review and meta-analysis. *Can Med Assoc J.* 2010;182(15):1609–16.
54. Guerado E, Cano JR, Pons-Palliser J. Should concurrent viral (including COVID-19) or bacterial infections be treated before performing surgery for hip fracture? *Bone Joint Res.* 2020;9(12):884–93.
55. Catellani F, Coscione A, D'Ambrosi R, Usai L, Roscitano C, Fiorentino G. Treatment of Proximal Femoral Fragility Fractures in Patients with COVID-19 During the SARS-CoV-2 Outbreak in Northern Italy. *J Bone Jt Surg.* 2020;102(12):e58.

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