



■ ARTHROPLASTY

Careful return to elective orthopaedic surgery in an acute hospital during the COVID-19 pandemic shows no increase in morbidity or mortality

**M. Jabbal,
N. Campbell,
T. Savaridas,
A. Raza**

*From Forth Valley Royal
Hospital, Larbert, UK*

Aims

Elective orthopaedic surgery was cancelled early in the COVID-19 pandemic and is currently running at significantly reduced capacity in most institutions. This has resulted in a significant backlog to treatment, with some hospitals projecting that waiting times for arthroplasty is three times the pre-COVID-19 duration. There is concern that the patient group requiring arthroplasty are often older and have more medical comorbidities—the same group of patients advised they are at higher risk of mortality from catching COVID-19. The aim of this study is to investigate the morbidity and mortality in elective patients operated on during the COVID-19 pandemic and compare this to a pre-pandemic cohort. Primary outcome was 30-day mortality. Secondary outcomes were perioperative complications, including nosocomial COVID-19 infection. These operations were performed in a district general hospital, with COVID-19 acute admissions in the same building.

Methods

Our institution reinstated elective operations using a “Blue stream” pathway, which involves isolation before and after surgery, COVID-19 testing pre-admission, and separation of ward and theatre pathways for “blue” patients. A register of all arthroplasties was taken, and their clinical course and investigations recorded.

Results

During a seven-month period, 340 elective arthroplasties were performed. There was zero mortality. One patient had a positive swab for COVID-19 while an inpatient, but remained asymptomatic. There were two readmissions within a 12-week period for hip dislocation. Patients had a mean age of 68 years (28 to 90), mean BMI of 30 kg/m² (19.0 to 45.6), and mean American Society of Anesthesiologists grade of 2 (1 to 3).

Conclusion

Results show no increased morbidity or mortality in this cohort of patients compared to the same hospital’s morbidity and mortality pre-COVID-19. The screened pathway for elective patients is effective in ensuring that patients can be safely operated on electively in an acute hospital. This study should reassure clinicians and patients that arthroplasties can be carried out safely when the appropriate precautions are in place.

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Introduction

Early in the COVID-19 pandemic, elective orthopaedic surgery was suspended, for the protection of patients and to preserve resources within the NHS.¹ Practices within orthopaedic departments have been through an array of changes; initially,

many orthopaedic staff were redeployed to support colleagues in other departments.² New guidance from the British Orthopaedic Association in April 2020 focused on minimizing non-essential operations and reducing patient visits to hospitals.³

Correspondence should be sent to
Mr Monu Jabbal; email:
monu.jabbal@doctors.org.uk

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As the pandemic progressed and daily figures of mortality were decreasing, orthopaedic services were sequentially reinstated, including elective arthroplasty. The demographic of patients who receive these operations are more likely to have risk factors deemed to put them at a high risk of morbidity and mortality from COVID-19: increased age, obesity, diabetes, and cardiac disease.⁴ The National Institute of Health and Care Excellence (NICE) produced clinical guideline 179 (NG179) for managing planned care episodes, a protocol for patient isolation and screening prior to elective surgery.⁵ This has been widely adopted by local health boards to facilitate a return to some elective operations. While many institutions have advised their new standards of care and precautions for their orthopaedic practice, to our knowledge no studies have yet provided feedback on effects to patients in hospitals which take acute COVID-19 admissions.

This places all parties involved in an uncertain position: patients may be concerned they can come to harm from exposure to the virus by being in hospital, and due to this surgeons may feel uncomfortable offering procedures. Service managers may find it difficult to forecast the ongoing return of all services if there is not feedback on the success of all the precautions which are now in place. This uncertainty is hazardous to reinstating orthopaedic services to full capacity. In May 2020, elective orthopaedic activity was just 4.9% of the normal level.⁶ In England, 18,000 people have now been waiting more than 52 weeks for their surgery, with an additional 9,000 waiting between 48 and 52 weeks.⁶ It has been forecasted that current waiting lists for arthroplasty are three times the pre-COVID-19 average, with a substantial cost implication involved to clear the backlog.⁸

In order to try and facilitate the recommencing of elective operations, a number of guidance documents were released. The Federation of Surgical Speciality Associations (FSSA) produced a clinical guide to surgical prioritization during the pandemic.⁹ Routine orthopaedic arthroplasty was categorized as priority 4 (procedures to be performed in > three months), the lowest priority. Only if patients had evidence of avascular necrosis of the femoral head or if waiting more than three months for arthroplasty could they be reclassified as priority 3 (procedures to be performed in < three months).

Scott et al¹⁰ have shown poor quality of life of patients waiting for arthroplasty and patients reporting their quality of life as “worse than death”, with pain being the main determinant. A follow-up study during COVID-19 has reported the proportion of patients in this state has almost doubled now, with increasing length of time on the waiting list being associated with worsening quality of life.¹¹ It is imperative that orthopaedic services resume and aim to get up to pre-COVID-19 capacity, if not greater. While the vaccination programme is a huge triumph for

Table 1. Hospital and geographical COVID-19 rates July 2020 to January 2021.

Variable	Mean (range)
Daily positive cases, n	34 (0 to 156)
Daily deaths, n	0.9 (0 to 6)
Daily tests, n	1,091 (223 to 2,525)
Positive test results, %	3 (0.0 to 16.3)
Incidence of COVID-19, n/100,000 of population	13.6 (0.3 to 50.9)
Weekly COVID-19 general occupancy, n	32 (11 to 61)
Weekly ICU occupancy, n	4.9 (1 to 12)

ICU, intensive care unit.

the NHS and the nation, robust protocols must be in place for future variants or even other future infectious diseases to ensure the service remains running.

The aim of this study is to investigate the 30-day mortality and perioperative complications associated with elective orthopaedic surgery performed when patients follow a screened, isolated pathway.

Methods

The study period is July 2020 to January 2021, representing the second wave of COVID-19 in the UK. This study was performed in Forth Valley Royal Hospital, an NHS acute district general hospital which serves a population of around 300,000. The single site has 860 beds. The maximum surge capacity of ICU beds is 29. The hospital takes acute COVID-19 admissions, has a “red” COVID-19 section of the ICU, and COVID-19-positive patients are operated on within the same theatre suite. The COVID-19 rates for the region (NHS Forth Valley - Clackmannanshire, Falkirk and Stirling) are summarized below (Table 1).

The “blue screened” safety pathway is described in Supplementary Material.

Patients. Any patient undergoing elective arthroplasty was included in the study. Of the data collected, no patients were excluded. Patients with an American Society of Anesthesiologists (ASA) grade¹² of 4 were not listed for surgery at this time as they were deemed too high-risk, and there were no other exclusion criteria. All operations were carried out in a single centre. A register of all arthroplasties performed during this period was kept. These patients were then followed up routinely at six weeks by an arthroplasty nurse practitioner. For comparison a cohort of pre-COVID-19 patients from the full 12-month period of 2019 was used. Data were taken from the Scottish Arthroplasty Project registry.¹³ This is a robust national database where every arthroplasty performed in Scotland is recorded, and every mortality and complication are recorded. These data are audited annually and reported back to surgeons.

During the study period a total of 340 patients underwent elective arthroplasty, with a ratio of 1:1.2 male:female. The mean age was 68.5 years (28 to 90), mean

BMI was 30.2 kg/m² (19 to 45.6), and mean ASA grade was 2 (1 to 3).

Ethical approval was not needed as all patient demographic data were already collected for the purpose of the Scottish Arthroplasty Project. Follow-up data were collected and securely held on an NHS network, with supervision from the chief investigator who is responsible for all data sharing.

Outcomes. The primary outcome measure was 30 -day postoperative mortality. Secondary outcome measures were nosocomial COVID-19 infection and postoperative complications. Electronic patient records were then searched based on unique patient identifier. This gave access to all investigations, records of hospital admissions and discharge, electronic correspondence from outpatient clinic, operation notes, and GP letters. The following information was searched for: age; sex; BMI; ASA; type of anaesthetic; type of operation; COVID-19 swab results; and any readmission or complication. For each patient, a search of all COVID-19 nasal swabs was done. This included preoperative screening and any subsequent tests done either as inpatient or in community post discharge. All patients have minimum eight weeks' follow-up, after which point any positive COVID-19 swab is not deemed to be related to their hospital admission. The rationale for this is that it will be two weeks from their six-week follow-up appointment, and beyond the incubation period should they be exposed at this appointment.

Data were analyzed using SPSS for Windows v. 27 (IBM, USA) and non-parametric Fisher's exact test was employed as most of the data were categorical in nature. Level of significance was set at $p < 0.05$.

Results

Operations. A total of 166 patients underwent total hip arthroplasty (THA), 156 underwent total knee arthroplasty (TKA), 15 underwent unicompartmental knee arthroplasty (UKA), and two underwent patellofemoral arthroplasty.

Type of anaesthetic. Overall, 57 patients had the operation under general anaesthetic, and 283 patients had the operation under spinal anaesthetic.

Positive COVID-19 swabs. One patient had a positive COVID-19 swab during their inpatient stay. This patient was a 54-year-old female with a BMI of 38 kg/m² and an ASA grade of 2 who underwent a TKA under a spinal anaesthetic on 13 January 2021. The patient was asymptomatic, and the swab was carried out routinely due to an inpatient stay of five days due to leaking wound. There was no subsequent mortality in this patient. Two patients had a positive COVID-19 swab in the community post-discharge; however, these were both over eight weeks postoperatively and therefore were not considered

Table II. Morbidity and mortality.

Complications	COVID-19 cohort	2019 cohort*	p-value†
Total operations, n	340	265	
Mortality, n (%)	0 (0)	1 (0.4)	0.236
Dislocations of THA, n (%)	2 (0.6)	1 (0.6)	> 0.999
Superficial wound infection, n (%)	4 (1.2)	N/A‡	
Deep prosthetic infection, n (%)	0 (0)	1 (0.56)	0.431
Thrombosis, n (%)	1 (0.3)	2 (0.8)	0.601
Total readmissions, n (%)	7 (2)	N/A‡	
Periprosthetic fracture, n (%)	1 (0.3)	N/A‡	

*12-month data reported to the Scottish Arthroplasty Project Database.

†Fisher's exact test.

‡Data not collected by the Scottish Arthroplasty Project.

N/A, not applicable; THA, total hip arthroplasty.

to be related to their admission. These patients did not require hospital admission and resulted in no mortality.

Complications. Two patients had dislocation of THA and four patients had a superficial wound infection managed with antibiotics alone. One patient presented with respiratory symptoms and was found to have bilateral pulmonary embolism. When patients presented with complications, they were admitted through the emergency department (ED), exposing them to potential COVID-19 patients. There was separate section of the ED for suspected COVID-19 patients with a temporary wall built in the ED to ensure no crossover of staff between non-COVID-19 and COVID-19 areas. All readmissions underwent COVID-19 testing. One patient had a periprosthetic fracture intraoperatively which was managed with plate fixation in the same sitting. For comparison, the complication figures from 2019 are given as reported to the Scottish Arthroplasty Project. The discrepancy in number of operations is due to two additional elective operating theatres being opened in 2020 to increase operation capacity. (Table II).

Discussion

To our knowledge, this is the first study to present patient outcomes following elective arthroplasty procedures in a district general hospital with acute COVID-19 admissions. We describe the results of 340 patients who underwent elective arthroplasty surgery between July 2020 and January 2021. During these months our trust was running at full elective capacity, and the overall mortality rate was 0%. Postoperative complications were not higher than patients operated on in the same hospital in 2019.

Out of the 340 patients included in the study, only one patient tested positive while an inpatient, and two patients tested positive at three and four months post-discharge, respectively, both of which were deemed to be unrelated to their admission. These patients did not have any additional clinical reviews or hospital visits after the six-week check. Eight weeks was deemed an appropriate threshold for defining a positive COVID-19 test to be unrelated to orthopaedic surgery as this is two weeks after the follow-up appointment, and outside

the mean 5.1-day incubation period as described by McAloon et al.¹⁴ In addition, government guidance at the time mandated a 14-day isolation period for potential COVID-19 contacts; after this period, if the contact did not have symptoms, there was no indication for testing or any further action.¹⁵

There is clear evidence that contracting COVID-19 in the perioperative period is associated with a significant increase in mortality. A study by the COVIDSurg Collaborative,¹⁶ looking at both elective and emergency surgery in 1,128 patients, found that postoperative pulmonary complications occur in half of patients with perioperative COVID-19 infection and are associated with a 30-day mortality of 38%. Elective patients who contracted COVID-19 had an average mortality rate across specialties of 19.1%, with orthopaedics consisting of 302 of the 1,128 patients (26.8%). Of these only 20 cases were elective, and specific outcome data for them were not available.¹⁶

Price et al¹⁷ investigated 30-day mortality in orthopaedic patients who underwent urgent or emergency surgery. They report of the 96 patients initially assessed as COVID-19-negative on admission, 9.4% (n = 9) subsequently tested positive within 30 days. Overall 30-day mortality was 3% (n = 3). In addition to ensuring that patients do not have COVID-19 at the time of surgery, the authors state that specific attention should be placed on the postoperative pathway to include minimizing inpatient stay, minimizing healthcare contacts, and recommending isolation in the immediate postoperative period.¹⁷

A meta-analysis published in January 2021 also found that mortality was significantly higher in patients with COVID-19 who underwent surgery, with an odds ratio of 7.9 for mortality in patients who underwent a surgical procedure while COVID-19-positive.¹⁸ The authors concluded that strategies are needed to be implemented to mitigate risk. The release of NICE guideline 179 has allowed trusts to develop pathways in order to minimize that risk.

As orthopaedic services were resumed, there have been favourable results from hospitals operating in a purely elective capacity. In the UK, Vusirikala et al¹⁹ have prospectively investigated the reinstating orthopaedic services in a "green"-only screened site reporting no mortality at 14 days and no ICU admissions in a series of 104 patients. Oussedik et al²⁰ concluded that a multi-factorial approach is needed to safely and effectively resume elective services to full capacity. They warn that the increase in precautions necessary to open up services again is likely to introduce significant cost and delays to musculoskeletal pathways, and will reduce the overall capacity to deliver surgical interventions.

The current study is the first to demonstrate no increase in mortality in elective patients when using a pathway

developed from NICE guideline 197 in an acute district general hospital. The current study showed no increase in incidence of patients undergoing elective arthroplasty contracting COVID-19 during the September and October 2020, when both the R number and incidence of new infections in Scotland were at their highest.²¹ The results support the safe recommencing of orthopaedic elective surgery when following a pathway based on NG179. Limitations of this study are the small sample size and its retrospective nature, as well as the relatively short duration of follow-up.

The blue-screened pathway developed for NG179 has allowed the re-introduction of elective arthroplasty operating with no increase in mortality or morbidity. We conclude the pathway for elective patients is effective in ensuring patients can be safely operated on electively in an acute hospital which takes COVID-19 admission. This study should reassure clinicians and patients that arthroplasties can be carried out safely when the appropriate precautions are in place.



Take home message

- It is safe to resume elective surgery in an acute hospital, with a screened pathway for patients.

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Supplementary material



A description of the "blue screened pathway" protocol.

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Author information:

- M. Jabbal, MSc, MRCS(Ed), Specialty Trainee
- N. Campbell, MRCS, Specialty Trainee
- T. Savaridas, FRCS, Orthopaedic Consultant
- A. Raza, FRCS, Orthopaedic Consultant
Forth Valley Royal Hospital, Larbert, UK.

Author contributions:

- M. Jabbal: Conceptualization; Methodology; Investigation; Data curation; Formal analysis; Writing – original draft; Writing – review & editing.
- N. Campbell: Data curation; Formal analysis; Writing – original draft.
- T. Savaridas: Project administration; Funding acquisition; Resources; Supervision; Data curation; Formal analysis; Validation.
- A. Raza: Project administration; Funding acquisition; Resources; Supervision; Validation; Writing – original draft; Writing – review & editing.

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