

Remote Follow-up of Shoulder Arthroplasty Patients During COVID-19 Pandemic - Is This the way Forward?

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Abstract

Background: The COVID-19 Pandemic has affected the way health care systems function across the globe. Apart from eliminating the risk of being in a vulnerable environment during the pandemic such as a hospital setting, virtual arthroplasty follow-up reduces the demand on funding and resources on the National Health Services (NHS).

Methods: We retrospectively reviewed our shoulder arthroplasty patients (55) operated between October 2018 to November 2020 at both our hospital sites. For remote follow-up, patients were contacted on a scheduled appointment date via telephone by an orthopaedic surgeon to enquire about their wound, pain and function. Patients were questioned as per questionnaire from the Oxford Shoulder Score (OSS) and American Shoulder and Elbow Surgeons (ASES) Standardised Assessment form.

Results: 50 patients were included in the final data set after excluding those who had died (5 patients). All patients had had final x-rays with full Covid-19 precautions at the time of final follow-up. No patient had wound problems except one who had concerns of wound appearance. There were no cases of notching, impingement, deep infection, dislocation or nerve injury. Of the 50 patients, 40 (80%) patients were satisfied to have a remote follow-up. 36 (72%) patients said they wouldn't mind a remote follow-up appointment.

Conclusion: Remote follow-up via audio consultation may be an effective alternative to in person visits after shoulder arthroplasty. Patients in this series demonstrated a high level of satisfaction with virtual visits and post-operative complications were effectively identified.

Keywords

Remote, follow-up, shoulder, arthroplasty, virtual

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Introduction

Shoulder Arthroplasty is the third most common joint procedure carried out worldwide following hip and knee Arthroplasty.¹ The incidence of shoulder replacement surgery is expected to increase in next 20 years due to aging population² as more and more surgeons are getting familiar with the operative technique. Despite the popularity of shoulder replacement procedure, the complications continue to persist. Complications include instability especially in the initial postoperative period, infection, fracture, nerve injury, notching, component loosening, acromial fracture.^{3–6}

The COVID-19 Pandemic has affected the way health care systems function across the globe. During both waves of the Pandemic as well as when lockdown was in force,

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elective clinics were cancelled as health care systems were stretched beyond limit. Most of shoulder arthroplasty patients operated for either elective or traumatic causes, belong to the older age group. Apart from eliminating the risk of being in a vulnerable environment during the pandemic such as a hospital setting, virtual arthroplasty follow-up reduces the demand on funding and resources on the National Health Services (NHS).⁷ A questionnaire/radiograph-clinic is a viable alternative to a traditional out-patient Total Joint Arthroplasty (TJA) follow-up, reducing follow-up burden by approximately 90%. These options have been proved to be not only convenient to the patient but also cost-effective to the NHS.⁸ A systematic review and meta-analysis performed to assess the use of telemedicine didn't demonstrate any significant difference in patient or surgeon satisfaction compared to in-person assessments.⁹ Another study showed that the use of telemedicine in place of in-person follow-up did not result in any meaningful differences in patient pain levels, physical function, activities of daily living, or mental health.¹⁰ The purpose of this study was to review shoulder arthroplasty patients remotely using Patient Reported Outcome Measures (PROMs) and identify complications early and assess patient satisfaction in the setting of the COVID-19 pandemic.

Materials and Methods

Between October 2018 and November 2020, we retrospectively reviewed our shoulder arthroplasty patients (55) operated at both our hospital sites by the senior author. All patients were investigated with preoperative anteroposterior (AP), axillary lateral views and scapular 'Y' views available on the Picture Archiving and Communication Systems (PACS) and were further evaluated with an Ultrasound scan performed by a musculoskeletal radiologist to assess status of rotator cuff. All patients had exhausted conservative means before a surgical procedure was considered. Of the 55 patients 52 had a preoperative Computed Tomography (CT) scan for surgical planning. The average age of patients undergoing any procedure [Reverse Total Shoulder Arthroplasty (RTSA), Total Shoulder Arthroplasty (TSA) or Hemiarthroplasty (HA)] was 78.34 (66-89) years. All patients operated for causes other than trauma were scored preoperatively as per the Oxford Shoulder Score (OSS) and American Shoulder and Elbow Surgeons (ASES) Standardised Assessment form. The pre-operative OSS and ASES were not relevant for trauma patients. All patients were operated in a beach chair position, and were anaesthetized using general anaesthesia and interscalene block. Standard delto-pectoral approach was used for all cases. Patients who underwent surgery for elective causes had uncemented fixation, while those who had RTSA for trauma had Hybrid fixation (uncemented glenoid and cemented stem). The data set included patients who were operated before the start of the Covid-19 pandemic and had an initial postoperative

follow up which was face to face (60% patients, $n=33$). However, with the onset of the Covid-19 pandemic; as per local trust and national guidelines all elective clinics were via telephonic consultation; and these patients ($n=33$) were subsequently followed up remotely. For remote follow-up, patients were contacted on a scheduled appointment date via telephone using their details from Cosmic an electronic patient record system. This was an audio consultation where the patient was contacted by a member of the team (all orthopaedic surgeons) to enquire about their wound (if recently operated), pain and function. The audio consultation would usually last approximately 5 to 10 minutes per patient. The questions were based on the questionnaire from OSS and ASES. Patients were able to book their own radiograph appointment at a time convenient to them with a radiology centre closest to their home. These centres, be it the primary two hospitals where the surgeries were carried out or within the community followed all precautions related to Severe Acute Respiratory Syndrome (SARS) Covid-19 virus and were linked via PACS to our central system. Once the radiographs were performed the patients would contact the secretary of the senior author (DL) who would then review them. The radiograph review would not take more than two minutes for any given patient. At the time of remote follow up 5 patients had died from causes not related to the surgery. The total number of patients included in the study were 50; of these 38 were women and 12 were men.

The indication for surgery was comminuted fracture of proximal humerus in 18 cases (36%), advanced glenohumeral osteoarthritis in 16 cases (32%) and rotator cuff arthropathy in 14 cases (28%). Revision surgery (4%) was performed for two patients. One patient was revised from a failed internal fixation to a Reverse Total Shoulder Arthroplasty for non-union of fractured fragments. The second patient underwent revision for a dislocation and a periprosthetic fracture following a mechanical fall. Both patients were originally operated by another surgeon which were subsequently revised by the senior author. All patients were operated using implant system from Wright Medical UK Ltd Tornier AequalisTM. There were 38 patients (76%) who underwent RTSA, 10 patients (20%) underwent anatomic TSA, one patient (2%) had a hemiarthroplasty and one patient (2%) was revised to a longer stem with change of liner and retention of glensphere and base plate. Patients operated for trauma as an indication had cemented stems with tuberosities repaired using the NICE loop. The laterality was 25 for each side (50%). 27 patients (54%) were operated between 2018-2019 while 23 patients (46%) were operated in 2020. All patients were immobilised in a polysling with body strap for 6 weeks with intermittent pendulum exercises initiated after 2 weeks of surgery along with active elbow and wrist mobilisation. The rehabilitation protocol was the same for both elective and trauma cases. All patients had virtual physiotherapy sessions during both peaks of the pandemic; as well as when the lockdown was

in force. They were given standard instructions for rehabilitation in the event of delay in physiotherapy consultation on account of the pandemic.

On contacting these patients, they were questioned about the status of their postoperative wound (for those recently operated), pain limiting mobility and or function and functional status based on OSS and ASES questionnaire. Thus, all patients had postoperative OSS and ASES scores. At the time of remote follow-up patients were asked, whether they were satisfied, not sure or dissatisfied with concept of remote follow-up. At the end of the consultation patients were asked if they were happy to follow-up subsequently via remote appointments or face-to-face appointments. All surviving patients participated in the remote follow-up and were consented at the start of the audio consultation if they were happy to be questioned and scored.

Results & Statistics

A total of fifty patients were available at the time of writing this study. The mean follow-up was 505 days (± 243 , minimum 151, maximum 924, 95% CI 439 to 571). Only patients who underwent elective procedures (excluding the revision case) were analysed for post-operative OSS and ASES scores. This is because patients who were operated for trauma were assumed to be having normal function prior to injury. There were, total of thirty patients operated for elective causes at time of final follow-up. The mean preoperative OSS significantly improved ($P < .0001$) from 14.17 to 40.25 (± 9.552 , minimum 14, maximum 48, 95% CI 36.69 to 43.82) (Figure 1). The mean preoperative ASES

significantly improved ($P < .0001$) from 14.67 to 80.99 (± 20.18 , minimum 30, maximum 100, 95% CI 73.46 to 88.53) (Figure 2). There were no cases of early notching, impingement, superficial or deep infection, dislocation or nerve injury.

Two patients, one each operated for fracture (humeral head split and neck fracture) and rotator cuff arthropathy sustained periprosthetic fractures after a fall. Both patients were managed non-operatively and at final review x-rays showed good radiological healing along with return to function. One patient had concerns about appearance of his wound few months post-surgery; and was advised to send a clinical photograph of wound on email to the senior author. After review of clinical photograph, the patient was reassured that there was nothing wrong with the wound and the appearance was so because of muscle wasting.

Of the 50 patients, 40 (80%) patients were satisfied to have a remote follow-up, while eight (16%) of them were not satisfied and two (4%) weren't sure (Figures 3 and 4). 36 (72%) patients said they wouldn't mind a remote follow-up appointment while 14 (28%) of them wished for a face to face review on repeat follow-up appointments. Our patient participation was 100% and no patient was lost to follow-up.

Discussion

The COVID-19 Pandemic has affected the way health care systems function across the globe. Various centres across the world have had to adopt to altered ways of practice in order to ensure a safe and a socially distant environment, both for patients and health care professionals. With

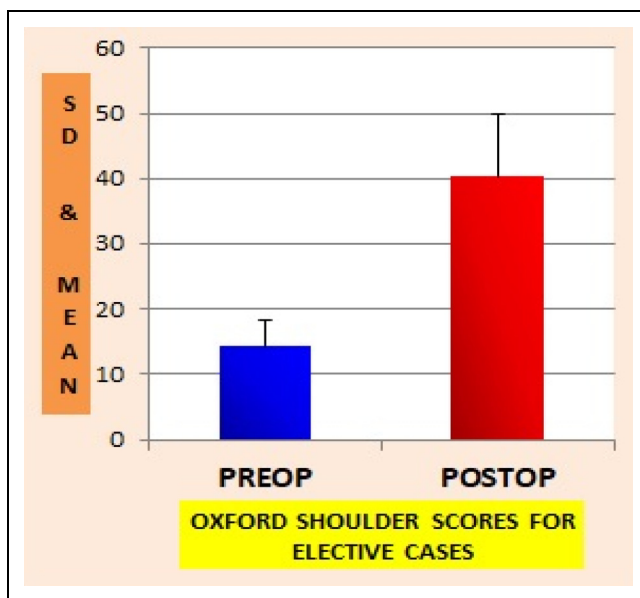


Figure 1. Represents the mean preop OSS [14.17] \pm SD [4.17] & the significantly improved ($P < .001$) mean postop OSS [40.25] \pm SD [9.55] for elective cases.

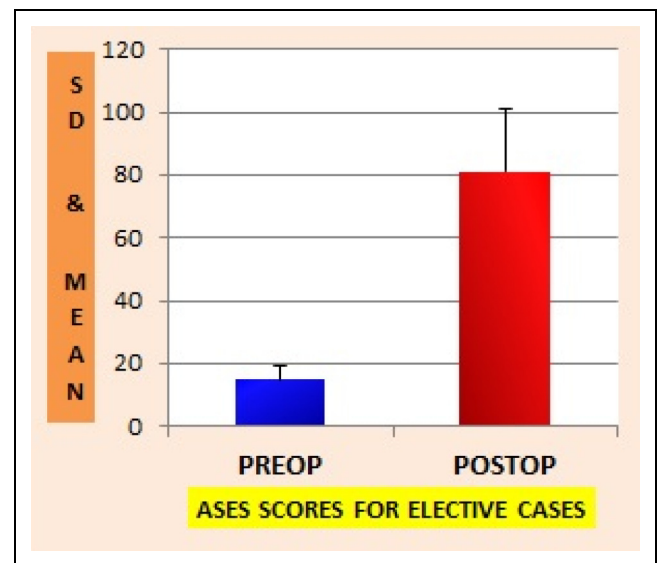


Figure 2. Represents the mean preop ASES [14.67] \pm SD [4.75] & the significantly improved ($P < .001$) mean postop OSS [80.99] \pm SD [20.18] for elective cases.

<u>Patient Satisfaction and Follow-Up Questionnaire</u>
<p>Q1. Are you satisfied with your remote/virtual follow-up appointment?</p> <ul style="list-style-type: none"> <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Sure <p>Q2. How would you like your subsequent follow-up appointment?</p> <ul style="list-style-type: none"> <input type="radio"/> Remote/virtual <input type="radio"/> Face to Face

Figure 3. Represents questions asked to patients to assess whether a remote follow-up was acceptable.

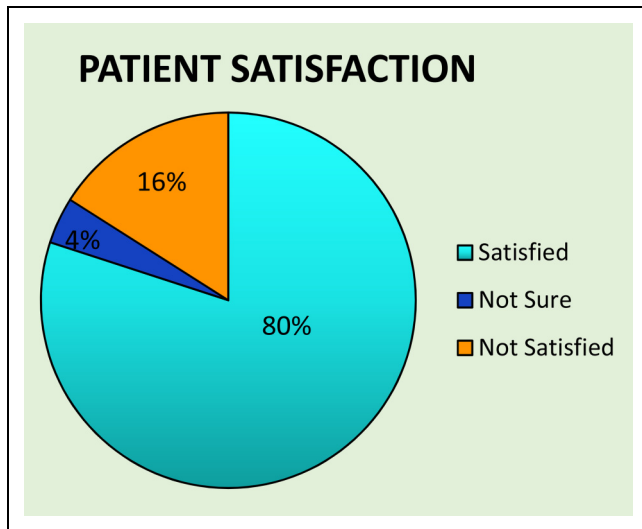


Figure 4. Represents significantly high ($P < .005$) [80%] patient satisfaction from our remote follow-up method.

cancellation of elective clinics and a state of lockdown, remote clinics offer an alternative adaptive means for orthopaedic surgeons to carry on with their professional commitments towards their specialties. The aim of a follow-up clinic is to review patient in terms of pain, function, wound problems and assess any radiological abnormalities. Routine follow-up appointments are a time-consuming process, for all those involved including patients, relatives, surgeons, clinic and supportive staff and the research team.¹¹ 'Virtual clinics' are safe and cost-effective alternatives to 'traditional clinics'; is well established for fracture

clinics.¹² Virtual platforms offer some degree of productivity and revenue generation in a state of lockdown and socially distant environment.¹³ Kingsbury et al.⁸ in their audit of 599 patients demonstrated that a questionnaire and radiograph-based remote review, provided sufficient information to allow specialists to accurately assess patients' post Total Joint Arthroplasty status. We retrospectively reviewed our shoulder arthroplasty patients using OSS and ASES, along with radiographs to assess for function, early complication and patient satisfaction. These radiographs were performed at patient's convenience at a radiographic facility closer to their home. This reduced the travel time and was convenient to the patient and their accomplice especially when SARS COVID-19 virus was prevalent in high numbers.

We had 100% participation in our remote follow-up which was higher than in other studies with reported rates ranging from 76% to 92%.¹⁴⁻¹⁶ This was because patients were sent out an appointment schedule, just like a routine face to face appointment schedule. This ensured that patients would anticipate our phone call and, in a way, guarantee excellent compliance. In another study,¹⁰ 11.11% patients found setting of virtual appointment difficult. 24% eligible patients declined to participate in the web-based virtual follow-up study conducted by Marsh et al.,¹¹ citing lack of computer or internet access. The mean age of patients declining participation was 74 and they thought that computer access may be age related. The average age of patients in our study was 78.34. We feel all our patients were comfortable with audio consultation, but if subjected to a video format would find it challenging. While in the study by El Ashmawy et al.¹⁴ The mean age of the patients was 71; who responded to PROMs questionnaires sent out by post.

Only 8% of their patients surveyed preferred a web-based follow-up.

We found that apart from the convenience to the patient and their care givers in terms of reduced travel time and cost benefit, the total clinic time significantly reduced. Multiple studies^{8,10,11,14} found virtual clinics to be more effective in terms of time and money both to the patient and the hospital. A telephone consultation which was carried out by one of the orthopaedic surgeons was not more than approximately 5 to 10 minutes per patient. The senior author (DL) personally reviewed all radiographs which would not take more than approximately two minutes for any patient. As patients were reviewed by the primary surgical team, decision making in terms of further management and follow-up review were quick, clear and precise and added to reduction in clinic times. This was supported by two studies.^{8,17} In one study,⁸ the local patient advisory groups consensus was: remote surveillance by a specialist unit was more acceptable than non-specialist units solely provided by General Practitioners (GPs). While in the other study,¹⁷ 77% patients, 95% GPs and 100% of orthopaedic trainees did not support of follow-up care being provided by specialist nurses and GPs in community. One of the challenges with remote follow-up is not to miss patients with complications and manage them appropriately. We didn't report any patient with instability, nerve injury, early notching, impingement and early or late infection. One patient who was operated in mid-march 2019, suffered a fall 6 weeks post-surgery and sustained a fracture around the humerus. This was managed non-operatively in a humeral brace and at the end of 3 months showed good radiological healing in a face to face follow-up. Another patient operated in October 2019, sustained a fall 6 months later and suffered a minimally displaced fracture through base of acromion process & spinous process of the scapula. This patient was asked to come in for face-to-face appointment by the senior author given the recent history of fall and poor progress in functional outcome. She was clinically and radiologically reviewed and reassured that no damage was done to the prosthesis and functional progress would develop, given encouraging examination findings. At 3 months she was reviewed face-to-face and found to have radiological union. Kingsbury et al.⁸ in their study identified all patients who needed increased surveillance, while Marsh et al.¹¹ didn't miss any patient who needed a subsequent revision using web-based follow-up. El Ashmawy et al.¹⁴ identified 3 patients who were referred for revision surgery and weren't aware of any "missed" patients via their virtual joint replacement follow-up clinic.

Sabbagh et al.¹⁰ in their study found no significant differences in mean ASES score, SF-12 Physical Component Summary score from the SF-12 (PCS) or Mental Component Summary score from the SF-12 (MCS) scores, or EuroQol instrument (EQ-5D-3L) index score between telemedicine and in-person groups regardless of whether

the data were stratified on the type of shoulder surgery (shoulder arthroscopy or replacement). Their results suggested that the use of telemedicine in place of in-person follow-up did not result in any meaningful differences in patient pain levels, physical function, activities of daily living, or mental health. They felt patient satisfaction in the telemedicine group was high because of low patient expectations regarding the availability and quality of follow-up for elective shoulder surgery on account of the pandemic. In our study, of the 50 patients, 40 (80%) patients were satisfied to have a remote follow-up, while eight (16%) of them were not satisfied and two (4%) weren't sure. We attributed this to low post-operative OSS and ASES scores and recent (less than one year) post-operative status. Patients who were more than a year into surgery and were progressing as anticipated were happy to continue remote follow-up. 36 (72%) patients said they wouldn't mind a remote follow-up appointment while 14 (28%) of them wished for a face to face review on repeat follow-up appointments. Sabbagh et al.¹⁰ didn't find any difference in patient preference for either telemedicine or in-person visit group, majority of patients in both telemedicine group (83.33%) and in-person group (70.37%) preferred face-to-face follow-up appointments. They found that, the most common reason for face-to-face consultation was that majority of patients felt a telemedicine visit lacked rigorous physical examination. They felt that telemedicine isn't a replacement to face-to-face clinic but born out of necessity of patient and provider safety under pandemic conditions.

Our study had limitations; first we didn't calculate the power of the study, to arrive at sample size of 50. Second, we didn't have a control group against which we could compare the remote follow-up data set. Third, there were different types of arthroplasty surgery performed; some for trauma and some for elective causes leading to heterogeneity in the study group. Some of our patients (60%, $n=33$) had initial in person follow-up. However, they were subsequently followed up remotely once lockdown was in force. We reported 100% compliance as all patients attended the remote follow-up clinic, although our data set was smaller than that in other studies.¹⁴⁻¹⁶ We felt our clinic time was reduced and there was no variability in terms of management and decision making as patients were reviewed by the primary surgical team and all radiographs were reviewed by the senior author. Majority of patients (80%) were satisfied by remote follow-up and we feel this could be because of favourable functional outcomes and encouraging functional recovery, reflecting as significantly improved scores. Face-to-face follow-up appointments should be arranged if patients cannot be contacted or remote follow-up highlights a cause for concern (particularly in those patients less than a year post-procedure). We conclude that, remote follow-up via audio consultation may be an effective alternative to in person visits after shoulder arthroplasty in a group of elderly patients. Patients in this series demonstrated a high

level of satisfaction with excellent compliance and post-operative complications were effectively identified and appropriately managed.

Future Recommendations: Video consultation may provide a better alternative for patients who are less than a year post-procedure and who want to minimise contact where possible given the current pandemic situation, however overcoming technology barriers in this age group to facilitate this contact would be challenging. Developing video demonstrations of physiotherapy exercises as part of rehabilitation post-procedure could ensure functional progress is not impeded during COVID-19 pandemic.

Declaration of Conflicting Interests

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Supplemental material

Supplemental material for this article is available online.

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