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IMPACT OF THE COVID-19 OUTBREAK ON SURGICAL MANAGEMENT OF MUSCULOSKELETAL ONCOLOGY PATIENTS: A MULTI-CENTER PROSPECTIVE COHORT STUDY

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ABSTRACT

Objective: To evaluate the impact of the Covid-19 outbreak on surgical management of musculoskeletal oncology patients.

Methodology: A total of 76 patients were identified and included in this observational study for which data was collected from the databases of Hayatabad Medical Complex, Peshawar & Dr. Ruth KM Pfau Civil Hospital, Karachi, Pakistan from March till August 2020. Patients having malignant bone and soft tissue tumours and locally aggressive benign tumours were included in this study. All the patients underwent PCR investigation for SARS-CoV-19 virus pre-operatively and surgeries were performed in PCR negative and asymptomatic PCR positive patients only, with protective equipment.

Results: In sample, 8 patients tested positive for Covid-19, out of which 2 were asymptomatic and hence surgery was performed. The remaining 6 were sent for home isolation, of which 2 did not return for surgery. Five patients had ablative surgery due to disruption in medical services whereas the initial plan was for limb salvage surgery. Eight patients developed complications while 2 patients passed away in the post-operative period. None of the patients had any Covid 19 related morbidity or mortality.

Conclusion: The study concluded that only a minute number of patients were suffered due to Covid-19 results. Disruption in services due to Covid-19 outbreak has impacted the efficient delivery of health care in various specialties including serious pathologies like musculoskeletal tumours.

Key Words: Covid 19; Corona virus; Sarcoma; Musculoskeletal oncology; Surgery.

INTRODUCTION

Musculoskeletal oncology is a challenging specialty with multidisciplinary involvement and complex surgical procedures which involves time bared decisions and treatments. Since the emergence of the Covid 19 virus, the health systems globally have come under enormous pressure after the first case was reported in Wuhan, China in December 2019.^{1,2} This situation was further worsened when the world health organisation declared it as a pandemic in March 2020 putting further pressure on health systems and also effecting the delivery of specialised care.³ This situation caused intense pressures on ailing economies and health systems where there were prevailing shortages. From March 2020, many countries and their health systems started adopting specialized measures and plans for delivery of care for both Covid and non Covid patients. A disruption in outpatient services further complicated

the continuity of care of patients particularly in developing countries where due to lack of organised primary health care system and patient tracking, caused major breakdown in communication and care. This led to a delay in presentation for new patients and also a delay in execution of planned procedures for complex cases like musculoskeletal oncology.

The challenges that were faced in economically deprived health systems during this pandemic were multiple and mainly included screening for Covid 19 and scarcity of protective equipment for health care staff.

This situation was further complicated due to the widespread tumours and misinformation prevalent in the society, labelling this virus as a “hoax” and “international propaganda” which did not help in the containment of the spread of the virus in the 1st wave of the pandemic. In Pakistan, due to the presence of very

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few dedicated centres for rare diseases like musculoskeletal tumours, the challenge to cope with this pandemic was enormous. As these oncological surgeries are classed as elective, any delay in treatment can lead to deleterious effects including failure to perform limb salvage surgery, development of metastasis and delay in delivery of adjuvant treatments like chemotherapy and radiotherapy. To combat these challenges, some organisations societies issued their guidelines for managing these non Covid pathologi.⁴⁻⁹

In this study, we aim to estimate the effect of the Covid 19 pandemic on the delivery of care to musculoskeletal oncology patients in 2 general hospitals of Pakistan under the care of 2 dedicated musculoskeletal oncology surgeons and describe both Covid and non Covid related complications and the impact of delay on the eventual surgical procedures performed. This study only includes the patients that presented to these units for treatment and hence does not represent the true scale of the impact of Covid 19 on the delivery of musculoskeletal oncology care.

■ METHODOLOGY

A total of 76 patients were identified and included in this study. The data for this prospective study was collected from the databases held at the two participating institutions, Hayatabad Medical Complex, Peshawar & Dr. Ruth KM Pfau Civil Hospital, Karachi, Pakistan. Data was collected from 10th March till 30th August 2020 and all the patients treated for bone and soft tissue tumours were included in this study. Pathologies that were treated included malignant bone and soft tissue tumours and locally aggressive benign bone tumours. All the patients on admission underwent a detailed history and examination and a Covid PCR (polymerase chain reaction) test. Patients who tested positive for Covid 19 on the PCR test and were asymptomatic, had their surgery with full personal protective gear for all

the treating health care professionals and were kept in isolation rooms. Patients who were symptomatic and had a positive Covid 19 PCR test were either sent home after consultation with the medical team or kept in the hospital for further treatment under the care of the medical team (Physicians) if there was a need. Subsequently, when they became asymptomatic and had a negative Covid 19 PCR test, they had their planned surgical procedure. During this period, at both the participating hospitals, all other elective surgeries were withheld excluding trauma and oncological procedures.

Following surgery, patients were discharged home as soon as they were deemed fit for homecare with the advice to practice self-isolation at home and have minimum contact with family members. Patients were seen at 2 weeks post-operative period for removal of stitches and mostly the final histology was available at that stage. If there was no impending need, patients were then seen at a reduced/specialised clinic at 6 weeks and then 3 months from date of surgery. Where needed, patients were referred for adjuvant treatment to their local referring oncology centre. Demographic data including age, gender, anatomical area involved and laterality was collected along with diagnosis, initial planned surgery and final surgery performed for the same patient, delay in time of surgery and any change in final surgical procedure performed. We also calculated the number of Covid positive patients and if any patients did not turn up subsequently for their surgical treatment. The total number of planned and unplanned amputations were also calculated along with 14 & 30 days morbidity and mortality.

■ RESULTS

A total of 76 patients were identified and included in this study with a mean age of 28.5 years (Range: 5-89 years) with 51 male and 25 female patients with the involved an-

atomical areas mentioned in Figure 1. The commonest diagnoses were Osteosarcoma followed by soft tissue sarcomas, giant cell tumour of bone/Aneurysmal bone cyst/Chondroblastoma's and Ewing's sarcoma. (Figure 2)

Three patients (3.9%) presented with fungating tumors and 2 (2.6%) with pathological fractures.

During testing, 8 patients tested positive on Covid 19 PCR test out of which 2 were asymptomatic and hence surgery was performed with full protective equipment for health care professionals. Of the remaining 6, all were sent home with medical advice and self-isolation and advised to return at 2-3 weeks following the test and to be listed for surgery when asymptomatic and had a negative Covid 19 PCR test. Of these 6 patients, 2 never turned up for surgery and could not be traced and hence excluded from further analysis when calculating surgical procedures and complications. Thirty patients had no delay in their surgery, whereas the mean delay in surgery from original planned date was 7.3 weeks for other patients (range: 1-16 weeks).

A total of 74 surgical procedures were performed with 58 patients undergoing resection of their tumour and limb salvage and 11 patients underwent planned ablative surgery. Five patients had ablative surgery whereas their initial planned surgery was limb salvage but due to delayed presentation and subsequent tumour progression, they underwent amputations. None of the patients who had positive Covid 19 PCR test had change in plan for their final surgery when they were asymptomatic.

Four patients had partial vascular injury per operatively which were repaired and had no further complications. A total of 8 patients developed some complications within the first two weeks post-operative period. Five

Table 1: Descriptive statistics for body image and psychological distress scale (N=250)

No.	Age & diagnosis.	Surgery.	Per operative complications.	Post-operative complications.	Final outcome.
1	14 years Ewings sarcoma	Recycled bone technique	None	Wound infection (14 days)	Uneventful
2	40 years Fungating osteosarcoma	Above knee amputation	None	Wound infection (14 days)	Uneventful
3	49 years Metastasis	Shoulder disarticulation	None	Wound infection (14 days)	Uneventful
4	40years Soft tissue sarcoma	Wide local excision and split skin grafting	None	Wound infection (14 days)	Uneventful
5	35years Soft tissue sarcoma	Wide local excision and rotation flap	None	Wound infection (14 days)	Uneventful
6	14 years Ewings sarcoma	Wide local excision and free fibula reconstruction	Vascular injury	None	Uneventful
7	11years Soft tissue sarcoma	Wide local excision	Vascular injury	None	Uneventful
8	43years Soft tissue sarcoma	Wide local excision	Vascular injury	None	Uneventful
9	6 years Ewings sarcoma	Wide local excision	Vascular injury	None	Uneventful
10	55 years Myxoidliposarcoma	Wide local excision	None	Wound infection (30 days)	Debridement and antibiotics
11	7 years Osteosarcoma	Recycled bone technique	None	Wound infection (30 days)	Debridement and antibiotics
12	20 years Giant cell tumor	Internal hemipelvectomy	None	Femoral artery thrombosis (14 days)	Embolectomy, Volkmann's ischaemic contracture in leg
13	44 years STS	WLE and proximal femur replacement	None	Femoral artery thrombosis (14 days)	Hip disarticulation
14	20 years Ewings sarcoma	Scapulectomy	None	Failure of suspensory reconstruction. (60 days)	Revision surgery

patients had superficial wound infection and did not require any redo surgery and they all healed with local wound care and systemic antibiotics. One patient who had internal hemipelvectomy developed a pulseless foot at 12 hours following surgery and was taken to theatre urgently for re exploration. An arteriotomy was performed and subsequent embolectomy revealed a large thrombus at the junction of iliac artery with common femoral artery. This patient also had fasciotomy in the leg but at 3 months follow up developed Volkmann's ischaemic contractures in the posterior compartment along with posterior tibial nerve injury and is planned for releases and muscle slide. Another patient who underwent resection and reconstruction of a proximal femur tumour developed vascular ischaemia at 3 days following surgery and

had failed attempt at embolectomy and at 5 days post-operative period, underwent a hip disarticulation without any further complications at 2 months follow up. One patient who underwent scapulectomy for Ewings sarcoma and suspensory reconstruction of shoulder had wound dehiscence and exposure of lateral end of clavicle due to failure of reconstruction at 2 months following surgery. This patient underwent excision of lateral end of clavicle and repeat reconstruction with a nylon tape and is doing well at 2 months follow up (Figure 3). Two patients had delayed wound infection at 30 days post-operative period and both required debridement and systemic antibiotics therapy without any further significant issues. (Table 1)

Two patients passed away in the post-op-

erative period. One patient had proximal femoral replacement for metastatic breast carcinoma and had an uneventful surgery but at 48 hours post-operative period developed severe hepatorenal shutdown and repeat scan suggested development of hepatic metastasis which were not present at the staging studies performed 6 weeks prior to surgery. The patient deteriorated significantly and with consent of family further, active treatment was withdrawn and the patient expired 96 hours following surgery. Another patient who underwent palliative below knee amputation for a fungating sarcoma, passed away at 4 months following surgery due to progression of systemic disease. None of the patients had any Covid 19 related morbidity or mortality.

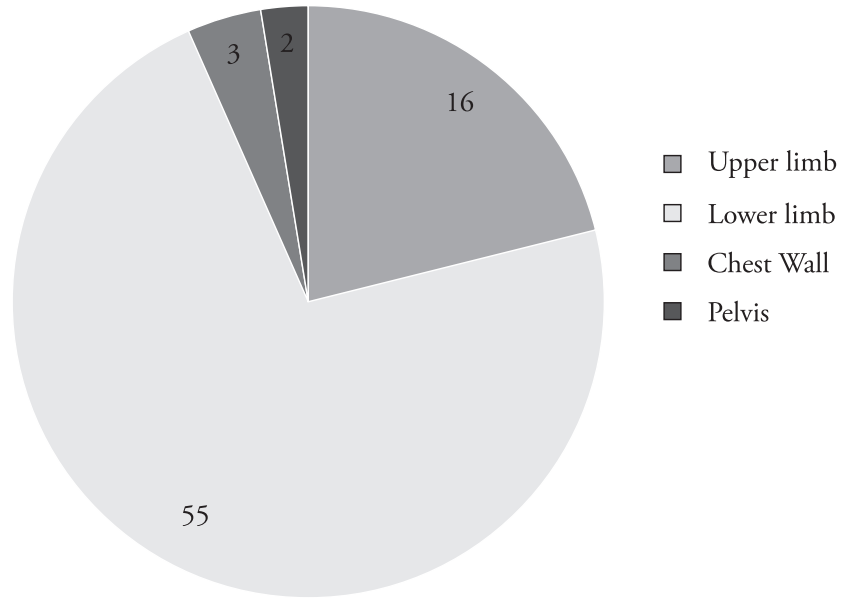


Figure 1: Distribution of cases in different anatomical areas

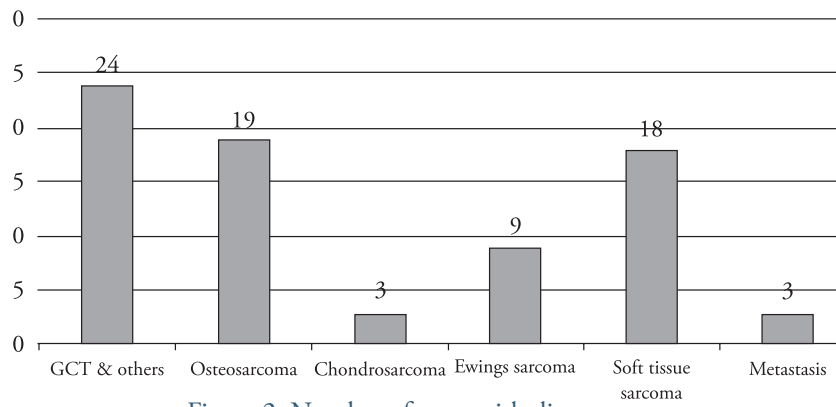


Figure 2: Number of cases with diagnoses



Figure 3: Patient with exposed lateral end of clavicle following scapulectomy for Ewing's sarcoma

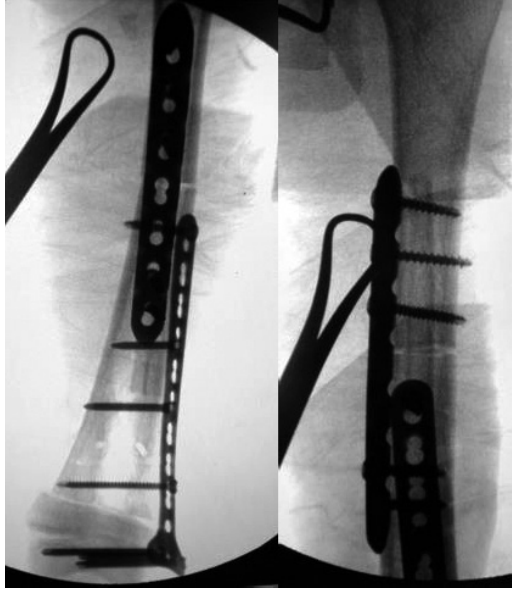


Figure 4: Biological reconstruction following liquid nitrogen treatment for distal femur Ewings sarcoma with fibula autograft as interposition

■ DISCUSSION

The Covid 19 pandemic has affected the whole globe on all frontiers and has put an enormous pressure on health systems. Most of the resources in healthcare globally have been directed towards prevention, screening and management of the Covid 19 effected patients. This meant disruption of elective health care services all across, leading to delays in treatment and planned surgical procedures. Orthopaedic oncology is one such specialty where due to involvement of multidisciplinary health care teams and time framed treatments, the effect could be hard felt. Major health care systems and medical societies issued their guidelines for safe delivery of health care during these unprecedented times.¹⁰⁻¹²

These are testing times not just for patients but health care professionals as well, as they are more prone to contracting this virus due to delivery of care on multiple frontiers. These matters get further complicated in countries and health systems where financial constraints and lack of dedicated systems are a major hurdle. In Pakistan, there was disruption of regular and elec-

tive services from 20th March 2020 which badly affected the delivery of medical care in various specialties. Due to lack of organised systems and specialised care centres, things were further complicated for patients with musculoskeletal oncology. In the 2 participating general hospitals in this study, all elective services were shut down and there was routine screening of patients admitted for trauma, emergency and oncological surgery which included clinical check-up, serological test including Covid 19 PCR test and a plain chest radiograph. All the patients were admitted in a dedicated orthopaedic ward where patients admitted were only for trauma and lifesaving procedures like musculoskeletal oncology. Patient contact was limited with visitors and both were advised to wear masks in the hospital and practice regular hand washing with sanitisers on the wards. All staff were advised to practice regular hand washing, limited physical contact with patients without the use of protective equipment's, self-screening for symptoms of Covid 19 after training and self-isolation at home and seeking medical treatment in case of any symptoms. During this study period a total of 21 healthcare professionals (HCP) in the 2 participating hospitals, involved di-

rectly or indirectly in the care of these musculoskeletal oncology patients developed mild to moderate symptoms of Covid 19 virus after testing positive with PCR test and were placed on home isolation. None of the HCP had any major medical problems and did not require hospitalization and following complete recovery re-joined their respective units. Contact tracing was performed for all positive patients and HCP, as far as possible, and standard advice regarding quarantine was provided.

Where needed, side rooms were provided for patients with co morbidities or who had received neoadjuvant chemotherapy and were at risk of developing sepsis due to concern of neutropenia and considered at increased risk of being exposed to the Covid 19 virus. Chenet al and Zhou et al in their studies have reported an increased risk of contracting the Covid 19 virus in patients with multiple comorbidities.^{14,15} In our study approximately 37% (28/74) of patients had received neoadjuvant chemotherapy. The practice of screening patients pre-operatively for Covid 19 virus varies in different hospitals and medical societies and ranges from only clinical screening to Covid 19 PCR testing.^{11,13} In our study 8 (10% approximately) patients tested positive for Covid 19 virus on PCR test. Stevenson et al reports that 51% of their patients had Covid 19 PCR test, based on clinical suspicion of whom only 3 tested positive.¹³ On the contrary, Sahbat et al have reported the use of chest CT scan for all their patients on admission and Covid 19 PCR test in only the suspected ones either clinically or based on the CT scan findings.¹¹ In our series we screened all the patients with Covid 19 PCR test rather than CT scan because of its cost effectiveness and ease of performing it compared to the later.

Guo et al reports a mortality rate of 20.5% patients in their patients who underwent orthopaedic surgery and were missed for the presence of the Covid 19 virus as

they were in the incubation period.¹⁶ Stevenson et al reports a 5% incidence of Covid 19 virus in their study but only 1% Covid related mortality.¹³ On the contrary, only 2 of our patients expired during the course of this study and none of the mortality was Covid related. This maybe because of the fact that screening was performed for all the patients pre-operatively. As this pandemic may last for a long time, surgical services cannot be withheld for long and some authors suggest resumption of elective surgical services under strictprecautions.^{17,18}

Although we are seeing a decline in the number of positive cases globally, there is still a concern about the 2nd, 3rd and subsequent peaks and hence the need for stringent policies in place to avoid future calamities and judicious use of scarce health resources. We had a small percentage of morbidity and mortality in our cohort but all were non Covid related. We attribute this mainly to the pre-operative screening with COVID PCR test, although we do not claim this to be an entirely effective way of screening patients. Considering our scarce resources, this was perhaps the best way of ensuring the delivery of medical care to our musculoskeletal oncology patients.

The authors accept that our sample size is small and the study is retrospective, but this may be used as an example for further larger studies to evaluate the best methods of delivery of safe and effective healthcare during this pandemic and especially in resource constrained health systems. However, this study does not include day cases and biopsy procedures performed under local anaesthesia which amounted to another 46 cases. The authors further agree that performing a COVID-19 PCR test may not be the best and only way of screening patients prior to surgery, but in our set up this was considered as an efficient tool. We also accept the fact that the results of this study do not represent the true impact of COVID-19

on musculoskeletal oncology patients in a country where the population is around 212 million, and that we had only 2 hospitals participating in this study and that patients are treated by general orthopaedic surgeons in various hospitals due to lack of specialised units and legislation.

CONCLUSION

The study concluded that only a minute number of patients were suffered due to Covid-19 results. We suggest that as this pandemic is likely to last for a long time, each country and health system should adopt policies and procedures feasible for their health system and economy to ensure safe delivery of healthcare both for patients and health care providers so that important services such as musculoskeletal oncology do not get disrupted.

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Author's Contribution

ZK conceptualized the research project, collected the data, and prepared the manuscript, BUS collected the data, and prepared the manuscript, MAK prepared the manuscript, and supervised the research. Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of Interest

Authors declared no conflict of interest

Grant Support and Financial Disclosure

None

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.