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Geriatric Critical Limb Ischemia during the Pandemic COVID-19, A Tertiary Center Experience from Oman

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ABSTRACT

Background: The COVID-19 pandemic in its second wave brought along an increase in acute limb ischemia internationally. We noticed an increase in the presentation of geriatric critical limb ischemia during the pandemic, at our center. Therefore, we analyzed this observation to ascertain reasons for this observation and the outcome of management.

Methods: Our retrospective, observational study identified patients sixty years old and above with critical limb ischemia from March 2020 to July 2021 at our tertiary care hospital in Muscat, Oman, during the COVID pandemic. Electronic medical records of the patients were accessed, and data collected to include - patient demographics, comorbidities, inflammatory markers, drug history, management, and a follow up period of 3 months. Ethics approval was granted by the university ethics board for the study and patient permission given for use of images and clinical information.

Results: There were 13 patients in our study, six patients with Rutherford grade 5, two grade 6 and the rest were lesser than that, with an average age of 72.8 years (64-96 years); nine (69.2%) were males. Of the 13 patients two

(15.4%) were COVID-19 positive, two had no comorbidities (15.4%) and eleven had at least 3 comorbidities (84.6%).

Ten patients underwent a CT angiogram; six (60%) had diseased femoropopliteal segment (TASC C, D). Eight were managed with endovascular intervention (80%); three were successfully re-vascularized and two underwent AKA, one BKA and two toe amputations. Two were unfit for imaging due to flexion deformities; one had non-constructible disease and were managed medically. There was no mortality during the study period.

Conclusion: We noticed a significant increase in the presentation of cases with CLI in the geriatric age group during the COVID pandemic at our center. This observation can be attributed to – CLI exacerbated due to subclinical COVID infection, more direct referral of lower grade of CLI patients considering that the secondary hospitals during the pandemic were unable to accommodate them, international travel ban/restrictions and restricted medical tourism. Travel restrictions within the country combined with patient/relative fear of contracting the COVID infection during hospital visits were other factors. A reduction in referrals was seen once tele-consultation facilities came into place.

Keywords: Geriatric; CLI; CLTI; COVID-19; Pandemic; Oman; Referrals; Middle east; Ischemia; Critical

INTRODUCTION

Critical limb ischemia [CLI] is a well-known presentation of peripheral arterial disease [PAD] that is associated with an annual increased morbidity, amputation and mortality[1] of 30% and a less than 30% five-year survival rate.[2,3] With the Novel Coronavirus [CV] pandemic, a simultaneous rise of CLI cases was noted, especially in the geriatric age group. Considering the poor outcome of this illness, we aimed to investigate the underlying causes that lead to increased referrals during the pandemic to our center, and management outcomes. This analysis will attempt to identify cause and effect of the above observation.

METHODS

This was a retrospective, observational, cohort study of geriatric patients with CLI referred to our tertiary center in Oman, between March 2020 and July 2021 during the COVID pandemic. WHO definition of geriatric age group, defined as 60 years or older, was used for the study. Electronic medical records of the patients were accessed, and data retrieved included patient demographics, comorbidities, inflammatory markers at time of illness, drug history, management. Patients were followed up in the clinic with a minimum duration of 1 month and a further follow up at 3 months either in clinic or by telemedicine.

Ethical approval was obtained from the institutional Research Ethics Committee.

RESULTS

There were a total of 13 patients in the study. The average age was 72.8 years (Range 64-96 years), nine were males and four were females; two were COVID-19 positive either before or during follow up.

Two patients had no comorbidities and eleven had multiple comorbidities of whom diabetes was present in 9 patients (69.2%), hypertension in 10 (76.9%), cardiovascular disease in 5 (38.5%), lower limb peripheral arterial disease in 4 (30.8%) and one was a smoker (7.7%). There were no patients with upper limb critical ischemia.
Ten of the thirteen patients underwent a CTA, while three of them were not suitable for imaging due to underlying chronic kidney disease with fear of contrast-induced nephropathy, and/or presence knee and hip flexion deformities that would result in sub-optimal study quality.

Of the ten patients who underwent imaging, six patients had total occlusion of the Femoro-Popliteal segment [FP] and four showed critical but non-occlusive stenosis in the same region. Eight cases were managed with endovascular intervention of which three had successful revascularization. In the remaining six, two underwent above-knee amputation, one underwent below-knee amputation and two underwent toe amputations. In the non-endovascular group, one patient underwent popliteal embolectomy for an acute-on-chronic thrombus which was not successful, and he required an above knee amputation, and one patient was managed with anticoagulation, but had lost follow up. One of the endovascular intervention cases developed a pseudo-aneurysm which was managed with ultrasound guided thrombin injection, successfully.
The patients that did not undergo imaging were managed medically with assumption of non-re-constructible PAD; two of these underwent major amputation and the third patient responded well to medical management and did not require minor or major amputation during the course of follow-up.
There was no mortality during the study period.

DISCUSSION

CLI is the most severe form of peripheral artery disease, a time-sensitive illness that is associated with increased morbidity and amputation, and an annual mortality[1] of 30% and a less than 30% five-year survival.[2,3] It is prevalent among elderly and patients with diabetics, chronic kidney disease, and smokers.[4] While atherosclerosis is the most common cause of CLI, other thromboembolic, atheroembolic and trauma-related diseases are precipitating causes too.[5] These obstructive lesions lead to hypoperfusion of the involved limb, activating a cascade of compensatory mechanisms that occur to protect the limb. As prompt as this response is, it does not promote healing and the limb continues to be at risk of loss and injury and hence the revised term – chronic limb threatening limb ischemia or CLTI.[5,6]

At our center, we noticed an increase in CLTI case referrals during the second wave of the pandemic, i.e., from March - July 2021. This increased prevalence of CLTI during the pandemic is attributed to various factors, including several nationwide lockdowns that may have led to hesitancy is seeking medical care for non-life-threatening emergencies.[7] Furthermore, international travel restrictions and quarantines may have resulted in significantly limited medical tourism, an important part of the healthcare system in Oman, where patients were eventually forced to seek treatment locally. As per the global disease control guidelines, individuals were advised to limit their

hospital visits until symptoms were,[8,9] while others had fear of visiting hospitals and acquiring the COVID infection, therefore contributing to further delay in disease presentation and eventual progression. During the second wave, secondary hospitals became overloaded with COVID patients, therefore, more cases were directly referred to our tertiary center. Finally, COVID itself is known to lead to acute limb ischemia, exacerbating an already critically threatened limb; while only 2 patients tested positive for the virus, 11 were asymptomatic and were therefore not routinely rested as per hospital protocol, hence, infection among more than 2 patients during the course of during follow up could not be excluded.

The main goal of treatment in CLTI is limb salvage, and a successful treatment is assessed by amputation free survival or decrease in the level of amputation.[10] However, despite the aggressive (vascular and endovascular) treatment, amputation rate remains high in the fragile geriatric age group.[3] Since the aging society has more comorbidities that can worsen their PAD and lead to overall hypoperfusion.

Amputation increases mortality, morbidity and second limb amputations. Diabetic patients are at the greatest risk of peripheral artery disease and eventual amputation, with an odds ratio more than 7.[11] Due to the underlying impaired blood flow, increasing the risk of infection and compromising the healing process. Similarly, our sample size included 69.2% diabetic patients. To prevent extremity amputations, the Carl T. Hayden Veterans Affairs' Medical Center in Phoenix, Arizona, introduced the high-risk foot clinic and followed patients' results over a 5 year period. This is a combined podiatry and vascular surgery outpatient service offered to specific patients with foot ulcerations, regardless of the cause. High risk patients are identified per a specific criterion (triaged), treated, educated, and followed closely. Treatments include lifestyle modification,[12] multi-specialty follow up and interventions, such as angioplasty, bypass surgery, to improve their outcomes. Results showed 85% patients with limb salvage, while elective revascularization procedures avoided an eventual amputation at rate of 79%.[11] Introducing this clinic to patients with CLI during this pandemic will aid in limb salvage prevent extremity amputation. Adding COVID diagnosis infection as a parameter to study, will aid in studying its effect on patients with PAD and their prognosis.

In the study, six (61.5%) of the patients underwent an amputation eventually, despite the aggressive management, with an average age group of 68.9 years old. 87.5% (7 out of eight) of the amputee group had at least three pre-existing comorbidities. 50% of the patients with pre-existing peripheral artery disease went into eventual amputation (2 out of 4), while the other half were treated with conservative management successfully when 25% of them had previously undergone angioplasty. Which suggests the importance of PAD early recognition and management in improving outcomes.[1] All the patients with previous amputation and PAD underwent a second amputation, regardless of their age. Associated comorbidities, such as diabetes, chronic kidney disease and PAD, are risk factors associated with unfavorable outcomes regardless of the patient's age.[10]

The limitations of our study are a small sample size, having a cross-matched control group in age and comorbidities, a larger sample size would identify statistically significant and more specific results.

Secondly, not all the patients were tested for the COVID virus at admission and hence we could have missed sub-clinical cases.

CONCLUSION

CLI among geriatric patients is linked to overall high-risk morbidity and mortality. Pre-existing CLI becomes of worse prognosis when associated with COVID infection, and vice versa. Therefore, early recognition and aggressive management of CLI prevents worse complications especially with the pandemic associated challenges faced in health care facilities. Recurrent lockdowns, safety regulations contributed to delayed presentation of CLI. International travel bans and burdening travel requirements increased the local offered care and restricted medical tourism.

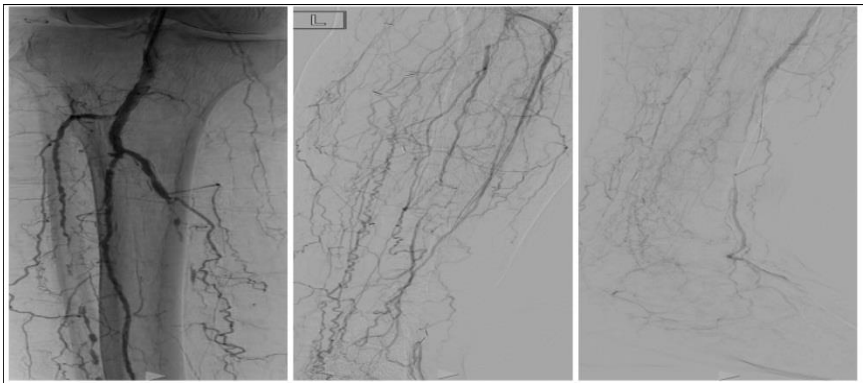

Figure 1: Digital subtraction angiography showing a) severe crural vessel disease b) almost complete occlusion of all 3 below knee vessels with extensive collateral formation c) poor perfusion to the foot due to severe below knee disease in what is known as “desert foot”.

Figure 2: Varying presentations of critical lower limb ischemia demonstrating the severity and delay at time of presentation

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