Case Report

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Thrombosis and amputation in acute COVID-19: A case report

Trombose e amputação na COVID-19 aguda: um relato de caso

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ABSTRACT

During the outbreak of COVID-19, it has been discovered that the infection was associated to increased risk of venous or arterial thromboembolic events and many other dysfunctions in various systems of human body. In relation to thrombosis, in molecular/cellular levels numerous signaling pathways due to dysregulated RAAS may contribute to the observed coagulopathy in COVID-19. On the other hand, excessive innate immune response to SARS-CoV2 for which there is no prior acquired immunity mediates various pathways that may lead to thrombosis. **Case report:** This case report analyzes those hematologic disfunctions in a patient affected for a post COVID-19 conditions associated to a long-term hospitalization resulting in a bunch of sequels. We emphasized the transfemoral amputation was due to proximal arterial thrombosis and the functional loss related to it. We aborted the whole rehabilitation plan and its implementation since the beginning of the process of dehospitalization. We describe the role of each professional of the multi-professional team, the pharmacologic and non-pharmacologic treatment, the assistive technologies applied, the other sequels related to post COVID-19 conditions and long-term hospitalization and their functional gains. We used the Functional Independence Measure (MIF) to do the follow up of the case, 84 to 96. As results of the therapeutic program, the patient could achieve a high grade of modified independence for activities of daily living (ADLS) and Instrumental activities of daily living. **Conclusion:** Thrombosis and amputations are complications in COVID-19 patients. The absence of a multidisciplinary program of rehabilitation will cause to the patient an increasing risk of development of psychologic affections and great impact of their social life.

Keywords: COVID-19, Amputees, Thrombosis, Rehabilitation

RESUMO

Durante a pandemia da COVID-19, foi descoberto que esta infecção estava associada ao aumento do risco tromboembólico venoso e arterial e de muitas outras disfunções de vários sistemas do corpo humano. Em relação à trombose, a nível molecular/celular numerosas vias de sinalização devido ao RAAS desregulado podem contribuir para a coagulopatias observada na COVID-19. Por outro lado, a resposta imune inata excessiva ao SARS-CoV2, para a qual não há imunidade adquirida prévia, medeia várias vias que podem levar à trombose. **Relato de Caso:** Este relato de caso analisa essas disfunções hematológicas em um paciente acometido por uma condição pós-COVID-19 associada a uma internação de longo prazo resultando em várias sequelas. Demos ênfase a amputação transfemoral foi decorrente de trombose arterial proximal e da perda funcional a ela relacionada. Abordamos todo o plano de reabilitação e sua implementação desde o início do processo de desospitalização. Descrevemos o papel de cada profissional da equipe multiprofissional, o tratamento farmacológico e não farmacológico, as tecnologias assistivas aplicadas, as demais sequelas relacionadas às condições pós-COVID-19 e internação de longa duração e seus ganhos funcionais. Utilizamos a Medida de Independência Funcional (MIF) para fazer o acompanhamento do caso, 84 a 96. Como resultado do programa terapêutico, a paciente conseguiu alcançar um alto grau de independência modificada para atividades de vida diária (AVD) e atividades instrumentais da vida diária. **Conclusão:** Trombose e amputações são complicações em pacientes com COVID-19. A ausência de um programa multiprofissional de reabilitação acarretará ao paciente um risco crescente de desenvolvimento de afecções psicológicas e grande impacto de sua vida social.

Palavras-chaves: COVID-19, Amputados, Trombose, Reabilitação

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Nothing to declare

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INTRODUCTION

Since the beginning of the spread of SARS-COV-2, different studies have reported acute arterial ischemia events, such as acute myocardial infarction, acute ischemic stroke, acute limb and visceral ischemia in COVID-19 patients. Furthermore, it has even been documented that these conditions can lead to loss of limbs and even death.[1,2,3]

Some series suggested high incidence of arterial thromboembolism, with heterogeneous frequencies and methodologies.[4,5]

Nevertheless, recent studies with systematic reviews and meta-analyses have described similar frequency of arterial thrombotic events compared to that found in patients hospitalized with influenza or with non-COVID-19 viral pneumonias.[6,7]

A plausible explanation for these phenomena is evidence suggesting that inflammation of immune and non-immune cells can lead to an imbalance of the procoagulant and anticoagulant state during viral infections, also impairing endothelial function. However, the pathological mechanisms have not been fully identified for most viral infections.[8]

In conclusion, the frequency of arterial ischemia events associated with COVID-19 can probably be explained by the high prevalence of this disease in the pandemic context, with pathophysiological mechanisms of endothelial aggression and coagulation disorders well described in other respiratory infections before the advent of the pandemic. Data available in the literature allow us to conclude association between arterial ischemic events, such as limb ischemia, and COVID-19. However, it is not possible to specifically attribute the incidence of these events to SARS-Cov-2.

The medical history of a case that underwent rehabilitation in the Instituto de Medicina Física e Reabilitação do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (HCFMUSP), São Paulo, Brazil was retrospectively reviewed, and their clinical and rehabilitation history discussed.

All procedures involving the participation of any health professional from the multiprofessional team were analyzed and assessed the way they influenced the rehabilitation process of the patient. This case report was submitted to the ethical committee of Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (CAAE: 76902523.0.0000.0068). Informed consent was obtained from the participant included in the study.

CASE REPORT

A 65 years-old woman with a history of diabetes mellitus, hypertension and hypothyroidism and amblyopia, underwent a long-term hospitalization related do COVID-19 infection. COVID-19 was detected in December/2020 on swab testing and hospitalized due to dyspnea and hypoxemia. She needed oxygenation therapy with a nasal oxygen catheter. After the first hospitalization, she had spent only four days at home before she needed to return to the hospital. In her second admission, she presented a sudden pain in right lower limb (RLL) associated with cyanosis. An arterial thrombosis was diagnosed through USG and she was submitted to a thromboembolectomy of RLL and fibular artery ligation.

Five days after the first intervention, a second one was needed, she had to undergo another thromboembolectomy. Finally, after fourteen days of hospitalization an amputation of the RLL was needed.

In the next few days, it progressed to a septic shock. Norepinephrine, hydrocortisone and vasopressin was administered, but it evolved to a Cardiopulmonary arrest for two minutes and an Acute Renal Injury KDIGO III. She spent one month at the Intensive Care Unit (ICU) and she was submitted to hemodialysis and mechanical ventilation. Three weeks after she was discharged from the ICU, she was de-hospitalized. She lost 25 kgs during the hospitalization.

ABOUT REHABILITATION PROCESS

At the beginning of the rehabilitation process, she was dependent on Activities of Daily Living and on wheelchair to locomotion. Her Functional Independence Measurement (FIM) was 84. At the admission in the Physical Medicine and Rehabilitation Institute of HCFMUSP, her comorbidities were: brain fog and posttraumatic stress related to COVID-19, dyspnea on moderate to severe exertion not related to cardiorespiratory conditions, worsening of the previous knee pain, hearing loss, knee osteoarthritis, grade one rotator cuff syndrome, phantom limb pain, diabetes mellitus, hypertension and hypothyroidism and amblyopia.

During the rehabilitation program, the main objective was to achieve a prosthetic gait that will provide a greater degree of independence and autonomy. Other objectives were: decrease in chronic pain and overall gain in autonomy and functionality. The multiprofessional team was formed by physiatrist doctors, physiotherapists, occupational therapists, physical educators, psychologists, nutritionists, social workers and nurses.

The therapies performed were conventional kinesiotherapy with active strengthening exercises, perceptual and environmental stimulation, balance and cardiovascular conditioning. It was also performed on a block of the suprascapular nerve, shock wave therapy on shoulder and on knee resulting in better pain control. It was prescribed progressive doses of gabapentin aiming to reduce episodes of phantom limb pain.

It is important to mention that it is more difficult to strengthen the antigravitational musculature in patients with amputation consequent to a thrombosis COVID-19 related then in patients with amputation non-COVID-19 related. Another important point considered in that rehabilitation process was the difficulty to maintain gains of cardiovascular conditioning, muscular mass and strength related to initiative deficit, muscle liposubstitution and integration of sensory, perceptual and motor pathways.

At the time of the mold fitting, the angle between hips and trunk was ten degrees but it evolved to 20 degrees caused by weakness of gluteus maximus and gluteus minimus muscles, limiting the orthostatism and the prosthetic knee control during the stance phase of the gait.

DISCUSSION

After the rehabilitation process involving the entire multiprofessional team, the FIM score reached 95 points. Beyond the improvement in the FIM score, the patient became more independent, being able to walk for a prosthetic gait, besides all the complicating factors (Chart 1).

The gait was a patient desire but emotional factors related to COVID-19 posttraumatic distress, cognitive changes (brain fog) with low initiative, adynamia and neuromuscular factors make the rehabilitation process longer and harder. The gait is not a simple and automatic question that requires low cognitive control. The

recent literature shows that the movement starts in cognitive areas, including limbic ones, and new or challenging situations, such as achieving a prosthetic gait, involve a high level of cognitive control.[9,10] Therefore, patients with Brain Fog and Posttraumatic stress related to COVID-19 with dysfunction of the effector and control systems (muscles, tendons, bones) may face greater difficulties to learn new motor activities which require the formation of new engrams.[11]

The COVID-19 amplifies the list of problems faced for amputated patients. So, it is necessary to be clear that the rehabilitation process of those patients will have more challenging situations related to cognitive, emotional and physical factors including both effector system, such as musculoskeletal, and control system (central and peripheral).[12,13] In view of those difficulties, a multiproffesional team is essential to achieve the prosthetic gait which positively contributes to mobility, functionality and autonomy which could lead to health promotion and disease prevention.[14,15]

In a polycomorbid patient, the acting of each integrant of the multiprofessional team is fundamental. Without a harmonic work of the whole group some parts of the process could be forgotten, reverberating in a therapeutic failure.

Chart 1. Functional Independence Measurement before and after the rehabilitation program

Items	Before Rehabilitation	After Rehabilitation
Eating	7	7
Grooming	6	7
Bathing	5	5
Dress upper body	5	6
Dress lower body	3	6
Toileting	5	5
Bladder management	5	7
Bowel management	5	7
Bed/chair transfer	3	3
Toilet Transfer	3	3
Tub/shower transfer	3	3
Walk/Wheelchair	4 (wheelchair)	3 (walk)
Stairs	1	2
Comprehension	4	5 (hearing)
Expression	7	7
Social Interaction	6	6
Problem Solving	6	6
Memory	6	7
Total	**84**	**95**

CONCLUSION

Thrombosis and amputations are complications in COVID-19 patients. The absence of a multiprofissional program of rehabilitation will cause to the patient an increasing risk of development of psychologic affections and great impact of their social life.

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