A case of meralgia paresthetica caused by prone positioning in a COVID-19 patient with acute respiratory distress syndrome

Tahsin Karaaslan,[1] Aysenur Avarisli,[2] Bulent Durdu,[3] Hayrettin Daskaya[4]

[1]Department of Nephrology, Medeniyet University, Goztepe Training and Research Hospital, Istanbul; [2]Department of Neurology, Medeniyet University, Goztepe Training and Research Hospital, Istanbul; [3]Department of Anesthesia and Reanimation, Medical Faculty, Bezmialem Vakif University, Istanbul; [4]Department of Infectious Diseases, Bezmialem Vakif University, Medical Faculty, Istanbul, Turkey

Abstract

COVID-19 critically ill patients usually require prone positioning for the treatment of respiratory failure caused by Acute Respiratory Distress Syndrome (ARDS). Prone position provides a better ventilation-perfusion compatibility, resulting in a significant improvement in oxygenation and a decrease in mortality, but prolonged prone positioning may cause Meralgia Paresthetica (MP), one of the most common mononeuropathies of the lower limb. The early diagnosis of MP is crucial to avoid a permanent damage with pain and disability, and to start immediately the correct treatment. In this article, we report a rare case of MP in a critically ill COVID-19 patient with ARDS, with the main aim to create awareness for MP among the medical team working.

Correspondence: Tahsin Karaaslan, Eğitim Mah. Dr. Erkin Cad. Medeniyet Üniversitesi; Göztepe Eğitim ve Araştırma Hastanesi, Nefroloji kliniği, 34722 Kadikoy/ Istanbul, Turkey.
Tel.: +90.505.935.11.22
E-mail: drtkaraaslan@hotmail.com

Key words: COVID-19; meralgia paresthetica; prone position; mononeuropathy; lateral femoral cutaneous nerve.

Contributions: Conceptualization: TK, AA, HD, BD; Methodology: TK, AA; Data collection: TK, AA, HD, BD; Writing: TK; Review & editing; TK, AA, HD, BD; Supervision HD, BD. All authors read and approved the final manuscript.

Conflict of interests: The authors declare no conflict of interest.

Availability of data and materials: All data underlying the findings are fully available.

Ethics approval and consent to participate: No ethical committee approval was required for this case report by the Department, because this article does not contain any studies with human participants or animals. Informed consent was obtained from the patient included in this study.

Consent for publication: The patient gave his written consent to use his personal data for the publication of this case report and any accompanying images.

Informed consent: Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

Received for publication: 1 January 2021.
Revision received: 21 December 2021.
Accepted for publication: 21 December 2021.

Emergency Care Journal 2022; 18:10310
doi:10.4081/ecj.2022.10310

Introduction

Novel coronavirus 2019 (COVID-19), which belongs to the *Coronaviridae* family, was first identified in the cases of pneumonia of unknown cause in Wuhan, China in December 2019.[1] The outbreak was declared as a pandemic by the World Health Organization in March 2020.[2] Clinical signs and symptoms of COVID-19 vary from asymptomatic disease to Acute Respiratory Distress Syndrome (ARDS) and multiorgan failure. The disease is classified as mild, moderate, severe, and critical depending on the clinical presentation.[3]

Meralgia Paresthetica (MP) is one of the most common mononeuropathies of the lower limb due to the compression of the Lateral Femoral Cutaneous Nerve (LFCN), which originates from the lumbar nerve roots (posterior L2/L3) and innervates the anterolateral surface of the thigh, from the level of the inguinal ligament almost to the knee. The LFCN passes under the inguinal ligament and travels toward the anterior superior iliac spine. Its anterior branch provides sensory innervation of the thigh (Figure 1).[4] If the LFCN is compressed along the nerve trace due to any cause, MP which is characterized by sensory complaints such as dysesthesia, tingling, numbness, and burning sensation at varying degrees at the anterolateral aspect of the thigh or, rarely, pain may occur.[5] MP can usually be corrected non-surgically, such as removal of compressive agents, use of nonsteroidal anti-inflammatory drugs, or local injections of corticosteroids.[6] In absence of improvement, neurolysis or decompression surgery may be considered.[7,8] Cases treated with peripheral nerve stimulants have been also reported.[9]

It has been well known that MP is generally seen in patients who have undergone spinal surgery in the prone position for more than 3.5 hours. However, it has been reported with increasing frequency that it occurs as a result of invasive or non-invasive mechanical ventilation, which has been commonly used to treat respiratory failure. As reported in literature, a prone position for at least 12 hours a day can reduce mortality in ARDS.[10] Considering that the prone position, which is increasingly used in COVID-19 patients with ARDS, can cause MP, a condition that can cause disability, healthcare personnel should be trained in taking preventive measures. In recent studies, MP has been shown to be associated with diabetes mellitus, obesity, tight clothing, and advanced age.[11] There are also case reports of MP caused by prone positioning for improving the oxygenation of the patients undergoing spine surgery or suffering from ARDS.[10,12]

In this article, we report a case of MP caused by prone positioning in a critically ill COVID-19 patient in the light of literature data.

Case Report

A 52-year-old male patient was hospitalized in the COVID-19 internal medicine clinic for fever, myalgia, cough, and dyspnea. His medical history was non-specific, except for asthma. He was a non-smoker and rarely needed bronchodilator agents. Seven days ago, Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) test using nasopharyngeal swabs due to suspected symptoms yielded positivity. The patient has been vaccinated with two inactive doses against SARS-CoV-2 two months ago. Since the diagnosis of SARS-CoV-2 infection, oral favipiravir (600 mg bid after a loading dose of 1600 mg bid) and subcutaneous (sc) enoxaparin (6000 IU/day) have been administered. At the time of admission, he was conscious, cooperated, and oriented. His Body Mass Index (BMI) was 31.5 kg/m^2. His vital signs were as follows: blood pressure 145/85 mmHg, heart rate 104 bpm, oxygen saturation (sO_2) 88% at room ambient, respiratory rate 26 bpm, body temperature 38.7 °C. On auscultation, bilateral course crackles, and wheezing were heard. Chest CT scan showed infiltration areas with air bronchograms and ground glass opacities mostly in the left lower lobe posterior and in the peripheral areas of both lungs. Multiple lymph nodes were observed in the mediastinal and hilar areas, the largest in the subcarinal area and measuring 13 mm in the short axis, probably due to infection. Linear atelectasis was also observed in the left lower lobe posterior. On day 3, he was transferred to the Intensive Care Unit (ICU) due to acute respiratory distress with severe desaturation (sO_2 62% at room ambient). Blood gas analysis revealed a severe acute respiratory failure with PaO2/FiO2 44 (PaO_2 35 mmHg, $PaCO_2$ 33 mmHg with high flow oxygen therapy). Transthoracic echocardiography showed a normal ejection fraction and a pulmonary artery pressure of 15 mmHg. The patient was treated with non-invasive mechanical ventilation (NIMV) and placed in a prone position for the first 16 hours (Figure 2). Philips ventilator Respironics V60 model (Respironics California, Inc. 2271 Cosmos Court USA) was used as NIV device. Any pressure offloading device was not used for the patient. Non-invasive ventilation was performed under 80% oxygen using a full-face mask. The PaO_2/FiO_2 ratio under NIMV was 105 mmHg. For the next four days, a set rotation consisting of pronation for 8 hours and supination for 16 hours was used. Anakinra, a recombinant human interleukin-1 receptor antagonist, three times daily sc and pulse methylprednisolone 1 g intravenous (iv) once daily for three days were administered. Then, methylprednisolone was continued at a maintenance dose of 60 mg/day iv. The patient's compliance was good, and sedation with opioids and/or benzodiazepines was not

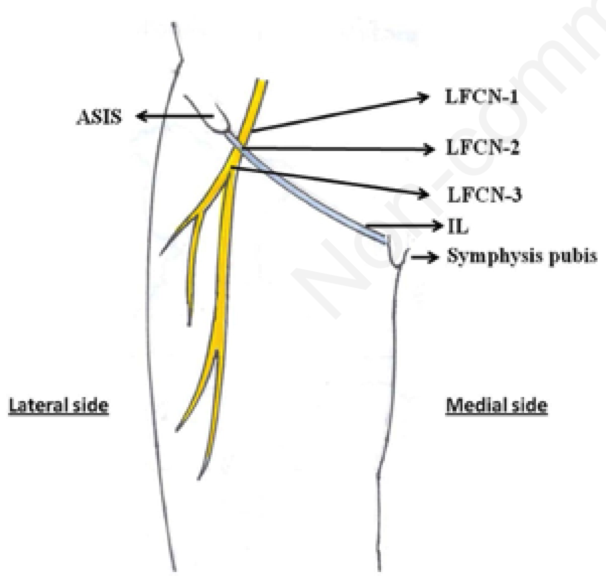

Figure 1. Anterior view of the right thigh shows the sites of LFCN-1, LFCN-2 and LFCN-3 sample collection. LFCN-1 – lateral femoral cutaneous nerve above inguinal ligament, LFCN-2 – lateral femoral cutaneous nerve at inguinal ligament, LFCN-3 – lateral femoral cutaneous nerve below inguinal ligament, ASIS – anterior superior iliac spine, IL – inguinal ligament (Figure from: Sadacharan C. Microanatomy of the lateral femoral cutaneous nerve in relation to inguinal ligament and its clinical importance. Medical Express 2016;3:M160106.)[4]

Figure 2. The patient treated in the ICU by being placed in the prone position.

necessary. On day 10 of ICU stay, he reported tingling, numbness, and pain sensation with touch on the anterolateral aspect of the right thigh. On day 12, NIV was stopped and replaced with low oxygen therapy by nasal prongs, reaching a satisfactory peripheral oxygen saturation (>90%). The patient was transferred to the COVID-19 internal medicine ward and discharged with oxygen concentrator after 18 days of hospitalization. At one month of follow-up, his complaints including tingling, numbness, and pain sensation on the anterolateral aspect of the right thigh were persistent. He had no spinal tenderness. The muscle strength and tendon reflexes were all normal. Since there was no loss of any motor neuron function, there was no disability in walking. Hypoesthesia and dysesthesia were present at the anterolateral aspect of the right thigh. The patient had no metabolic risk factors for neuropathic pain, and creatine kinase values were normal. He was treated with oral methylprednisolone 8 mg daily and oral vitamin B1, B6, and B12 supplements with regular leg and back exercises. Lumbar magnetic resonance imaging showed no disc herniation or mass. Electroneuromyography was performed 1.5 months after the onset of his complaints with the suspicion of subclinical critical illness polyneuropathy due to the prolonged ICU stay. Nerve conduction studies revealed normal motor findings for bilateral tibial and peroneal nerves and right median and ulnar nerves. Sensory nerve conduction of bilateral sural and LFCN, right median and ulnar nerve were also normal; however, the latency, amplitude, and conduction velocity were asymmetric in the right LFCN than the left LFCN (Table 1). Although the nerve conduction study results were within the normal range, right-sided complaints were considered to be secondary to prolonged prone positioning in the ICU, leading to LFCN compression and neuropathic pain. Based on the clinical findings, medical history, and examination results, the patient was diagnosed with MP with subnormal electrophysiological responses and persistent sensory complaints. Patient's complaints regressed with symptomatic medical treatment (indomethacin 25 mg bid, gabapentin 600 mg tid, thioctacid 600 mg once a day) and pulse radiofrequency to the LFCN,[13] but unfortunately a complete recovery was not obtained. The patient did not accept local steroid injection and surgical treatment options.

Discussion

The COVID-19 pandemic has dramatically increased the number of ICU cases with severe respiratory failure and requiring respiratory support in a prone position. Through its cytopathic effect, severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2) induces direct injury to the alveolar cells, by reducing surfactant synthesis and triggering mononuclear inflammatory cells to cause interstitial infiltration in the lungs and alveoli with alveolar membrane formation, increased angiotensin-2-related lung damage, and microthrombi formation in the microvascular circulation. All these processes are responsible for impaired ventilation and perfusion.[14,15] In such cases, severe hypoxemia may occur. Clinical neurological manifestations of COVID-19 widely vary from mild anosmia to seizure, coma, and strokes.[16]

Table 1. Lower limb electroneuromyographic findings.

Stimulated nerve	Latency	Amplitude	Conduction velocity
Right LFCN	4.25	12.7	52.4
Left LFCN	3.65	15.3	65.2

LFCN: lateral femoral cutaneous nerve.

Over the last five decades, prone positioning has been used to treat hypoxemia and improve the gas exchange in severe ARDS patients,[17] also in COVID-19 patients outside the ICUs.[18] In a meta-analysis of 11 randomized-controlled studies involving 1,142 ARDS patients, Lee *et al*. examined the efficacy and safety of ventilation in prone position. The authors concluded that prone positioning yielded a significant improvement in oxygenation and a significant decrease in mortality.[19]

MP has been reported frequently in cases of ARDS due to causes other than COVID-19, and in patients who were placed in the prone position due to spinal surgery. During the COVID-19 pandemic, patients who developed respiratory failure were often placed in the prone position in order to obtain better oxygenation, with or without mechanical ventilation. Patient compliance is extremely important in both prone position and NIMV with a helmet or full face mask. Indeed, Bastoni *et al.* in their series of 10 cases, reported that 4 patients could not achieve success in the prone position due to non-adherence to treatment.[20] Sedation can be useful to increase the patient's compliance and comfort.[18]

There are no randomized controlled studies on the benefits of the prone position in patients who cannot be intubated.[21] Again, there are no controlled studies comparing curarized and non-curarized patients. Theoretically, the frequency of compression of peripheral nerves may be excessive in curarized patients due to complete loss of limb movements. However, the correctness of this should be demonstrated by studies.

Similar to our case, Nersesjan *et al.*[22] found MP in two of 61 patients who recovered from COVID-19 at three months of follow-up. Christie *et al.*[23] also reported post-discharge MP in 10 (33%) of 30 patients who were diagnosed with COVID-19 and hospitalized in the ICU. More intriguingly, prone positioning was not applied in six of these patients. Serrano Barrenechea *et al.*[24] found MP in three COVID-19 patients requiring intensive care in the prone position for a longer time period. There is no clear information on what is the minimum time in the prone position for MP to develop.

In the literature, LFCN entrapment neuropathy has been associated with male sex, advanced age, diabetes mellitus, obesity, and tight clothing.[11] Electrophysiological studies are useful in the diagnosis of MP. Sensory nerve conduction studies should be performed bilaterally and orthodromic technique should be adopted. Recent studies have also demonstrated that dermatomal somatosensory evoked potentials have a high sensitivity in the diagnosis of MP.[25] Consistent with the literature, our case presented all predisposing factors for MP, being a male obese patient aged above 50 years. We consider that, along with these predisposing factors, prolonged prone positioning in the ICU may have led to the development of LFCN compression and MP in our patient.

Conclusions

In conclusion, MP is not uncommon among patients requiring intensive care in the prolonged prone position, such as COVID-19 patients with ARDS who require ventilation. These patients should be evaluated regularly both during the hospitalization and after discharge for the risk of MP, and early treatment should be initiated to avoid permanent disability. Creating awareness for MP among the medical team working in the ICU or Emergency Wards will ensure early diagnosis. Extra padding below the anterior superior iliac spine in prone positioning is recommended to prevent MP.

References

1. Chen X, Tian J, Li G, et al. Initiation of a new infection control system for the COVID-19 outbreak. Lancet Infect Dis 2020;20:397-8.
2. Sohrabi C, Alsafi Z, O'Neill N, et al. World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). Int J Surg 2020;76:71-6.
3. Hassan SA, Sheikh FN, Jamal S, et al. Coronavirus (COVID-19): A review of clinical features, diagnosis, and treatment. Cureus 2020;12:e7355.
4. Sadacharan C. Microanatomy of the lateral femoral cutaneous nerve in relation to inguinal ligament and its clinical importance. Medical Express 2016;3:M160106.
5. Cansü E, Yücel İ, Özturan K. Meralgia paresthetica: Case report in a policeman. J Med Duzce 2010;12:67-9.
6. Grossman MG, Ducey SA, Nadler SS, et al. Meralgia paresthetica: diagnosis and treatment. J Am Academy Orth Surg 2001;9:336-44.
7. Kaiser R. Meralgia paresthetica. Rozhledy v chirurgii: mesicnik Ceskoslovenske chirurgicke spolecnosti 2018;97:286-290.
8. Chen CK, Phui VE, Saman MA. Alcohol neurolysis of lateral femoral cutaneous nerve for recurrent meralgia paresthetica. Agri 2012;24:42-4.
9. Langford B, Mauck WD. Peripheral nerve stimulation: A new treatment for meralgia paresthetica. Pain Med 2021;22:213-6.
10. Juhl CS, Ballegaard M, Bestle MH, et al. Meralgia paresthetica after prone positioning ventilation in the intensive care unit. Case Rep Critical Care 2016;2016:7263201.
11. Wongmek A, Shin S, Zhou L. Skin biopsy in assessing meralgia paresthetica. Muscle Nerve 2016;53:641-3.
12. Yang SH, Wu CC, Chen PQ. Postoperative meralgia paresthetica after posterior spine surgery: incidence, risk factors, and clinical outcomes. Spine 2005;30:E547-550.
13. Philip CN, Candido KD, Joseph NJ, et al. Successful treatment of meralgia paresthetica with pulsed radiofrequency of the lateral femoral cutaneous nerve. Pain Physician 2009;12:881-5.
14. Pollard CA, Morran MP, Nestor-Kalinoski AL. The COVID-19 pandemic: a global health crisis. Physiol Genomics 2020;52:549-57.
15. Hanley B, Lucas SB, Youd E, et al. Autopsy in suspected COVID-19 cases. J Clin Pathol 2020;73:239-42.
16. Ellul MA, Benjamin L, Singh B, et al. Neurological associations of COVID-19. Lancet Neurol 2020;19:767-83.
17. Douglas WW, Rehder K, Beynen FM, et al. Improved oxygenation in patients with acute respiratory failure: The prone position. Am Rev Respir Dis 1977;115:559-66.
18. Paternoster G, Sartini C, Pennacchio E, et al. Awake pronation with helmet continuous positive airway pressure for COVID-19 acute respiratory distress syndrome patients outside the ICU: A case series. Med Intensiva 2020;S0210-5691(20)30273-4.
19. Lee JM, Bae W, Lee YJ, et al. The efficacy and safety of prone positional ventilation in acute respiratory distress syndrome: updated study-level meta-analysis of 11 randomized controlled trials. Critical Care Med 2014;42:1252-62.
20. Bastoni D, Poggiali E, Vercelli A, et al. Prone positioning in patients treated with non-invasive ventilation for COVID-19 pneumonia in an Italian emergency department. Emerg Med J 2020;37:565-6.
21. Richards H, Robins-Browne K, O'Brien T, et al. Clinical benefits of prone positioning in the treatment of non-intubated patients with acute hypoxic respiratory failure: a rapid systematic review. Emerg Med J 2021;38:594-9.
22. Nersesjan V, Amiri M, Lebech AM, et al. Central and peripheral nervous system complications of COVID-19: a prospective tertiary center cohort with 3-month follow-up. J Neurol 2021;268:3086–104.
23. Christie F, Quasim T, Cowan R, et al. Meralgia paraesthetica in intensive care unit survivors of COVID-19. Anaesthesia 2021;76:712-3.
24. Serrano Barrenechea L, Nordin J, Sörbo A. [Meralgia paresthetica after prolonged prone position at the intensive care unit among COVID-19 patients. A case report]. Lakartidningen 2021;118:20163.
25. Nouraei SA, Anand B, Spink G, et al. A novel approach to the diagnosis and management of meralgia paresthetica. Neurosurg 2007;60:696-700.