

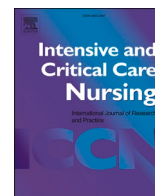


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## Case Report

## Masseter muscle pressure injury: First report of a prone position complication in patients with COVID-19

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## ABSTRACT

We report the case of a 59-year-old, obese woman who underwent prolonged prone position during the medical management of an acute respiratory distress syndrome induced by SARS-CoV-2 infection, complicated by a masseter muscle pressure injury. Such side effect may be underestimate in intensive care units and should be prevented by prophylactic dressings on facial weight-bearing sites. The understanding of facial deep tissue injury is essential to guide clinical detection and management of such a complication in COVID-19 patients.

## Implications for clinical practice

- Obese patients in the intensive care unit are at higher risk of developing pressure injuries, they thus require close monitoring.
- Pressure injuries are not only superficially localized: deep tissues, such as muscles, may be involved.
- Examination in obese patients may be more difficult because of excessive adipose tissue and requires trained staffs.
- Sequelae of prone positioning complications may require specialized management after intensive care discharge.

## Introduction

As an adjuvant to mechanical ventilation, prone positioning (PP) is an effective treatment for acute respiratory distress syndrome (ARDS) due to SARS-CoV-2 severe infection (Shelhamer et al, 2021). Numerous PP side effects have already been described (Binda et al, 2021; Bruni et al, 2021). They usually result in a soft tissues compression. Some of them involve the face as corneal abrasion or skin pressure ulcers (Sanghi et al, 2021; Perrillat et al, 2020). Others affect the limbs or peripheral nervous system (Malik et al, 2020; Brugliera et al, 2021). In this case, we report a masseter muscle pressure injury complicating PP in patients with ARDS in relation with the medical management for a COVID-19.

## Case report

A 59-year-old woman was admitted to an intensive care unit (ICU) for a SARS-CoV-2 hypoxemic pneumonia. She was morbidly obese (BMI = 43 kg/m<sup>2</sup>) with medical history of type 2 diabetes mellitus and arterial hypertension. RT-PCR returned positive for SARS-CoV-2B.1.1.7 variant. Despite high oxygen concentration mask (15 L/min), oxygen saturation was 85% and arterial blood gas analysis revealed hypoxemia (66 mmHg). A chest CT-scan revealed bilateral ground-glass opacities occupying more than 70% of the lung, suggesting COVID-19 pneumonia with a severe expansion. High-flow oxygen therapy (50 L/min, FiO<sub>2</sub> = 95%) remained insufficient to maintain adequate oxygen intakes. The

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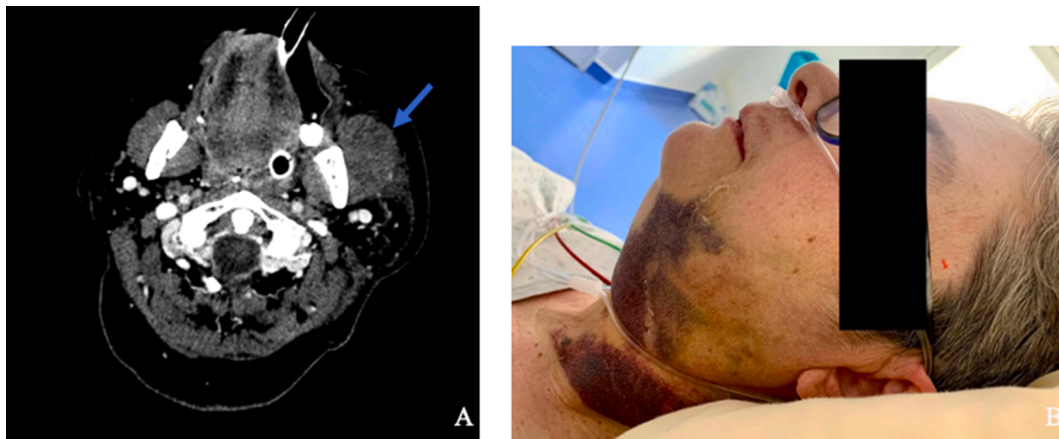
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**Fig. 1.** (A) Axial section of face CT scan showing an inflamed and edematous left masseter muscle. Heterogeneity with hypodensity areas demonstrating a muscle suffering (Blue arrow). (B) Parotido-masseteric region swelling with a large submandibular and cervical ecchymosis.

patient also first underwent three awake PP sessions (16 h/day) with full-face mask for non-invasive ventilation. After initial oxygenation improvement, she presented – 6 days later – a ventilatory exhaustion with hypoxemia leading to orotracheal intubation. She was immediately prone positioned after intubation with a 16–18 h/day protocol. PP procedure consisted in positioning the patient with the arms alongside the body, palms up, on an adjustable-pressure mattress (Nimbus Professional ArjoHuntleigh Getinge group, Malmö, Sweden). Two caregivers per side, with a leader at the head who coordinated proning and assured endotracheal tube. The head was positioned on a “U-shaped” silicone gel cushion. She received low-molecular-weight heparin (40 mg twice daily). Hemodynamic condition remained stable; she did not receive any vasopressors. After the first intubated PP 16 h long period, left hemifacial permanent swelling was noticed. Clinical examination revealed a spontaneously indurated painful left cheek swelling, measuring 8 cm long, without erythema nor any other cutaneous lesion. A 25 mm trismus was also noticed. Injected cervicofacial CT-scan revealed heterogeneous and increased in volume masseter muscle (Fig. 1-A). There were no purulent Stenon’s discharge, no clinical nor radiological signs of cellulitis of odontogenic origin nor skin infection. She did not receive intramuscular anaesthetic. The diagnosis of masseter muscle injury due to a prolonged pressure, was evoked. Medical management consisted in grade I and II analgesics and antibiotic prophylaxis (amoxicillin-clavulanic acid). Two days later, pain and swelling gradually got lower and a large ecchymosis appeared in parotido-masseteric region (Fig. 1-B).

Respiratory state rapidly improved after two PP sessions allowing extubation three days later. Two months after hospital discharge, swelling had completely disappeared, but limitation of buccal opening (30 mm) and masticatory pain remained disabling. The patient declined maxillofacial physiotherapy sessions prescribed.

## Discussion

To date, numerous PP complications in patients with COVID-19 have been reported. Among them are mainly described facial pressure injuries involving skin and ocular surface (Binda et al, 2021; Sanghi et al, 2021; Perrillat et al, 2020) with their potential sequelae (Schols et al, 2021). However, only few descriptions of such proning complication involving facial deep tissues are reported in literature (Perrillat et al, 2020; Abbal et al, 2012).

Masseter muscle injury could be considered as a pressure-related deep tissue injury (DTI). As a deep tissue, muscle is more vulnerable to compressive forces than skin (Kottner et al, 2009). In the present case, prolonged PP may have generated tissue pressure between underlying surface and bony prominence. This pressure decreased arterial blood

flow and led to muscle hypoxia. Tissue suffering generated interstitial myoedema due to capillary vasodilatation and created venous stagnation that augments edema. This led to ischemia, which occurs when interstitial pressure is higher than capillary pressure. We hypothesize a multi-factorial pathophysiology involving deep tissue pressure, hypoxaemia and high thrombotic risk condition (resulting from obesity, immobility and COVID-19 thrombogenic microvasculopathy) (Magro et al, 2020).

The main symptom is an intense pain. This may cause a problem with sedated patients for diagnosis, even more because skin appearance can be falsely reassuring. In addition, a higher BMI is associated with an increased frequency of pressure injuries in ICU (Binda et al, 2021), whereas obese patients clinical examination may be limited by adipose panicle hypertrophy.

During acute phase, treatment consists in pressure relieving, symptomatic measures with analgesics, cold and positioning the head at 45° when laying. At worst, prolonged ischemia (>6h) may lead to muscular necrosis. Muscle tissue heals with fibrosis, and it could cause invalidating functional sequelae such as: chronic pain, induration, limitation of buccal opening and mastication/eating troubles. Aftereffects of masseter muscle fibrosis can be improved by active and passive maxillo-facial physiotherapy sessions, which permit to recover normal and painless buccal opening. Massages can be useful to stimulate lymphatic drainage and cutaneous suppleness recovery.

ICU caregivers have to be aware of such complication and trained to prevent and manage it. Before PP, eyes should be closed and teguments inspected. Head should be placed on circumferential silicone gels or foam dressings for a better distribution of pressure points, with a frequent head repositioning to alternate every 2–3 h the compressed side. Skin should be protected from endotracheal tube with gauzes. Active monitoring with regular examinations during sessions should be practiced. Finally, systemic parameters interfering with wound healing, such as hypoxaemia, anemia, or malnutrition should be preventively corrected (Perrillat et al, 2020; Peko et al, 2020; Moore et al, 2020; Bruni et al, 2021; Team et al 2022).

## Limitations

We acknowledge some limitations regarding our case, especially the lack of objective findings about diagnosis and pathophysiology. For example, it would have been relevant to see if creatine phosphokinase blood level was increased, as an objective sign of muscle tissue suffering.

## Conclusion

This case-report highlights unknown PP complication in COVID-19

patients. Masseter muscle pressure injury is an atypical location for DTI. It results in multifactorial etiologies including patient characteristics (obesity), COVID-19 pathophysiology and medical devices. It may cause important functional impairment at sequela stage in case of a lack of diagnosis. Simple clinical elements and objective CT-scan signs of muscular suffering permit to reach the diagnosis and preventive measures could avoid ischemia.

### Patient consent

The patient described in this report has provided written informed consent granting the authors permission to share photographs and details of her case.

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### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.iccn.2022.103251>.

### References

Abbal, B., Choquet, O., Gourari, A., Capdevila, X., 2012. Une complication inédite liée au décubitus ventral prolongé : l'ischémie de compression avec hématome du muscle masséter. *Annales Françaises d'Anesthésie et de Réanimation* 31, 166–168.

- Binda, F., Galazzi, A., Marelli, F., Gambazza, S., Villa, L., Vinci, E., Adamini, I., Laquintana, D., 2021. Complications of prone positioning in patients with COVID-19: a cross-sectional study. *Intensive Crit. Care Nurs.* 67, 103088.
- Brugliera, L., Filippi, M., Del Carro, U., Butera, C., Bianchi, F., Castellazzi, P., Cimino, P., Capodaglio, P., Monti, G., Mortini, P., Pradotto, L.G., Priano, L., Spina, A., Iannaccone, S., 2021. Nerve compression injuries after prolonged prone position ventilation in patients with SARS-CoV-2: a case series. *Arch. Phys. Med. Rehabil.* 102 (3), 359–362.
- Bruni, A., Garofalo, E., Longhini, F., 2021. Avoiding complications during prone position ventilation. *Intensive Crit. Care Nurs.* 66, 103064.
- Kottner, J., Balzer, K., Dassen, T., Heinze, S., 2009. Pressure ulcers: a critical review of definitions and classifications. *Ostomy/Wound Manage.* 55, 22–29.
- Magro, C., Mulvey, J.J., Berlin, D., Nuovo, G., Salvatore, S., Harp, J., Baxter-Stoltzfus, A., Laurence, J., 2020. Complement associated microvascular injury and thrombosis in the pathogenesis of severe COVID-19 infection: a report of five cases. *Transl. Res.* 220, 1–13.
- Malik, G.R., Wolfe, A.R., Soriano, R., Rydberg, L., Wolfe, L.F., Deshmukh, S., Ko, J.H., Nussbaum, R.P., Dreyer, S.D., Jayabalan, P., Walter, J.M., Franz, C.K., 2020. Injury-prone: peripheral nerve injuries associated with prone positioning for COVID-19-related acute respiratory distress syndrome. *Br. J. Anaesth.* 125 (6), e478–e480.
- Moore, Z., Patton, D., Avsar, P., McEvoy, N.L., Curley, G., Budri, A., Nugent, L., Walsh, S., O'Connor, T., 2020. Prevention of pressure ulcers among individuals cared for in the prone position: lessons for the COVID-19 emergency. *J. Wound Care* 29 (6), 312–320.
- Peko, L., Barakat-Johnson, M., Gefen, A., 2020. Protecting prone positioned patients from facial pressure ulcers using prophylactic dressings: a timely biomechanical analysis in the context of the COVID-19 pandemic. *Int. Wound J.* 17 (6), 1595–1606.
- Perrillat, A., Foletti, J.-M., Lacagne, A.-S., Guyot, L., Graillon, N., 2020. Facial pressure ulcers in COVID-19 patients undergoing prone positioning: how to prevent an underestimated epidemic? *J. Stomatol. Oral Maxillofacial Surg.* 121 (4), 442–444.
- Sanghi, P., Malik, M., Hossain, I.T., Manzouri, B., 2021. Ocular complications in the prone position in the critical care setting: the COVID-19 pandemic. *J. Intensive Care Med.* 36 (3), 361–372.
- Schols, R.M., de Henau, M., Colla, C., van den Kerckhove, E., Tuinder, S.M.H., van der Hulst, R.R.W.J., Piatkowski, A.A., 2021. Facial scars due to prone position pressure ulcers: underestimated sequelae in COVID-19 survivors? *Aesthetic Surg. J.* 41 (11), NP1812–NP1813.
- Shelhamer, M.C., Wesson, P.D., Solari, I.L., Jensen, D.L., Steele, W.A., Dimitrov, V.G., Kelly, J.D., Aziz, S., Gutierrez, V.P., Vittinghoff, E., Chung, K.K., Menon, V.P., Ambris, H.A., Baxi, S.M., 2021. Prone positioning in moderate to severe acute respiratory distress syndrome due to COVID-19: a cohort study and analysis of physiology. *J. Intens. Care Med.* 36 (2), 241–252.
- Team, V., Jones, A., Weller, C.D., 2022. Prevention of hospital-acquired pressure injury in COVID-19 patients in the prone position. *Intensive Crit. Care Nurs.* 68, 103142.