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Reconstructive

Facial Pressure Sores in COVID-19 Patients during Prone Positioning: A Case Series and Literature Review

Thibaud Mernier, MD*
Corentin Taveau, MD*
Curtis L. Cetrulo Jr, MD†
Marion Goutard, MD*†
Alexandre G. Lellouch, MD, PhD*†

Background: COVID-19 has been a source of several stays in intensive care units, increasing the number of prone positioning. In parallel, complications increased, such as facial ulcers. Herein, we present a literature review and a case series about facial pressure sores in COVID-19 patients during prone positioning. This study aimed to show that such facial pressure sores may require surgical intervention in specific cases.

Methods: We performed a search of the literature with the Pubmed database, and we selected 13 articles for review. Therefore, we analyzed the results among the most frequent locations of facial ulcers: cheeks, ears, lips, nose, and chin. We also reported three original clinical scenarios with a gradual surgical approach to address facial pressure sores from less invasive to more invasive surgery (corresponding to the reconstructive ladder strategy) during the COVID-19 period.

Results: We identified 13 articles related to the topic. Only four clinical cases discussed a surgical treatment but only for complications such as bleeding, infection, and sequelae after long-term management. Faced with a lack of literature about surgical options, we reported our case series showing that surgical treatments could be increasingly complex among the sore grades. The following surgical approach was selected: debridement, skin graft, and local or free flaps.

Conclusions: Surgical intervention is the last course of treatment for pressure sores. However, the need for later surgical revision cannot be excluded, especially regarding the face, in case of dyschromia or retraction affecting the facial aesthetic subunits. *(Plast Reconstr Surg Glob Open 2022;10:e4610; doi: 10.1097/GOX.0000000000004610; Published online 12 October 2022.)*

INTRODUCTION

Since the start of the COVID-19 pandemic, various pulmonary, ENT, vascular, and neurological events,[1–3] often requiring intensive care,[4] have been observed and linked with the infection by the SARS-CoV-2 virus. The most severe cases of this infectious disease are also associated with skin manifestations, either due to the viral infection itself or its means of treatment.[5,6] Healthcare professionals also often reported facial cutaneous injuries due to prolonged wearing of personal protective equipment.[7,8]

In intensive care units (ICU), prone positioning (PP)[9] is an integral part of treating patients with severe pulmonary viral lesions induced by the coronavirus-19 disease (COVID-19). Pressure ulcers are the most frequently reported complication of prone positioning.[10] Prolonged prone position for comatose patients can be responsible for facial pressure wounds that may lead to nose or ear necrosis.[11] Prevention of those injuries is critical in clinical treatment and nursing.[10] Alternate facial rotations, intermittent repositioning (every 2 hours), and the use of anti-pressure sore cushions under the chest and the pelvic area are effective ways to reduce the number of adverse events but may be insufficient in some cases.[12] Longer prone times appear to increase the risk for pressure injury development.[13] Administration of vasopressor agents also favors those occurrences.[14] As COVID-19 cases are still surging, avoiding such facial defects is essential to prevent further mutilations in critically ill patients. About half the patients treated with prone decubitus develop injuries from the head and neck region.[13,15]

*From the *Department of Plastic Surgery, European George Pompidou Hospital, University of Paris, Paris, France; and †Vascularized Composite Allotransplantation Laboratory, Center for Transplantation Sciences, Massachusetts General Hospital, Harvard Medical School, Boston, Mass.*

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Nonetheless, the literature on facial defects in severe COVID-19 cases remains relatively poor despite its prevalence. Consequently, we reviewed the literature and discussed the various therapeutic options used for the most recurrent locations of facial ulcers: the cheeks, ears, lips, nose, and chin.[13] Herein, we present a series of clinical cases of facial injuries in COVID-19 patients cared for in our plastic surgery department at European Hospital Georges Pompidou. This study aimed to show that surgery might be necessary to treat these lesions to avoid later unaesthetic outcomes.

METHODS

The literature search was performed within the Pubmed database. We integrated all articles published until December 31, 2021. Only articles about COVID-19 patients with facial injuries were included in our selection. Search terms were [facial injuries] or [facial wound] or [facial pressure injuries] or [facial bedsore] and [COVID-19].

Filters included classical articles, journal studies, multicenter studies, observational studies, comparative studies, controlled clinical trials, evaluation, and validation studies. Duplicate publications were excluded. We excluded all articles about prevention, prevention devices, and types of masks, and concentrated on patients who developed facial pressure sores due to prone positioning. Two authors independently completed the article selection. Signed consent was obtained after oral and written information regarding the clinical cases. We decided to report three cases of surgical approach of these lesions since we have been requested in our department for lesions that required surgery during the COVID-19 period.

RESULTS

Thirteen publications were selected from the Pubmed database that reported facial ulcers due to prone positioned patients treated for COVID-19. The flowchart is presented in Figure 1. The most frequent locations of facial ulcers caused by COVID-19 treatment cited in the reviewed articles are summarized in Figure 2. The incidence of facial sores described in the literature is summarized in Figure 3.[12,13,16,17]

CHEEKS

Ten articles reported cheek pressure ulcers.[10–14,16–20] Of those, three were case reports,[14,18,20] and others were systematic reviews, reviews of the literature,[12] and series of cases.

Facial and limb edema is commonly found in patients treated for COVID-19 by prone positioning,[19] as it interferes with the physiologic venous return.[9] This edema, combined with the bad position of the patient or misplacement of the life-support materials (endotracheal tubes, probes, or lines), can lead to facial ulcers. Facial wounds due to PP can affect up to 70% of patients,[19] and some may require surgical debridement and reconstruction[11] even though most are limited and graded I or II.[12]

Takeaways

Question: Do the complications of prone positions due to COVID-19 need a surgical treatment?

Findings: After reviewing the literature about COVID-19-related facial injuries, we were faced with a lack of data about surgical treatments. Here, we report three clinical scenarios of surgical management of facial sores due to prone positions. Such lesions may be addressed with various surgical techniques, ranging from skin graft to staged reconstruction with free flaps.

Meaning: Our cases demonstrated that some lesions could make use of more complex surgical treatment; this has not yet been reported in the literature.

According to Ayala et al,[20] PP-related facial ulcers mainly affect the cheeks, and the diagnosis may be delayed by the presence of a tape securing the endotracheal tube.[20] Occasionally, diagnosis cannot be made until the endotracheal tube is removed and replaced with a tracheotomy.[14]

Ibarra et al[17] reported 70% of anterior pressure sores affecting the face and 18% on the cheeks. Of those, 28% were grade 1 ulcers, 64% were grade 2 ulcers, and all responded well to nonsurgical wound care.

In their cohort study, Shearer et al[13] found that nearly half of the PP patients developed ulcers from the head and neck region; 83.8% of those lesions affected the cheek region. In their study, surgical intervention was not necessary to treat the PP-related facial lesions.

Yu et al[10] reported four articles about pressure injuries due to prone positioning and endotracheal cannula. The chin area was described as one of the most affected regions. However, no surgical treatment was related.

Perrillat et al.[18] described two cases of grade 2 facial lesions treated with standard wound care. However, they reported subsequent face swelling caused by a masseter myositis. It is well described that those can become the gateway for deep tissue infections.[15,17] Even though the physiopathology remains unclear, we can hypothesize that in the context of severe COVID-19 pneumonia, microvascular injury and thrombosis may also favor the development of pressure ulcers.[18]

EARS

Five articles referred to ear injuries in the context of PP.[11–13,16,19] Capasso et al[16] found that the ears were the most frequent site of pressure injuries on the face. In their series, 18% of patients with pressure injuries experienced ear injuries due to prone positioning and respiratory assistance devices. They occurred more frequently when the head was positioned laterally[16] An alternative pressure redistribution failed to prevent 21% of ear injuries. Shearer et al[13] stated that half the patients with facial PP also experienced ear injuries.

However, the systematic review by Gonzalez et al[12] found that ear injuries occurred only in 7.5% of cases, mainly classified as grade I or II sores. Douglas et al[19] described a frequency of ear injuries of 27.87%, whereas

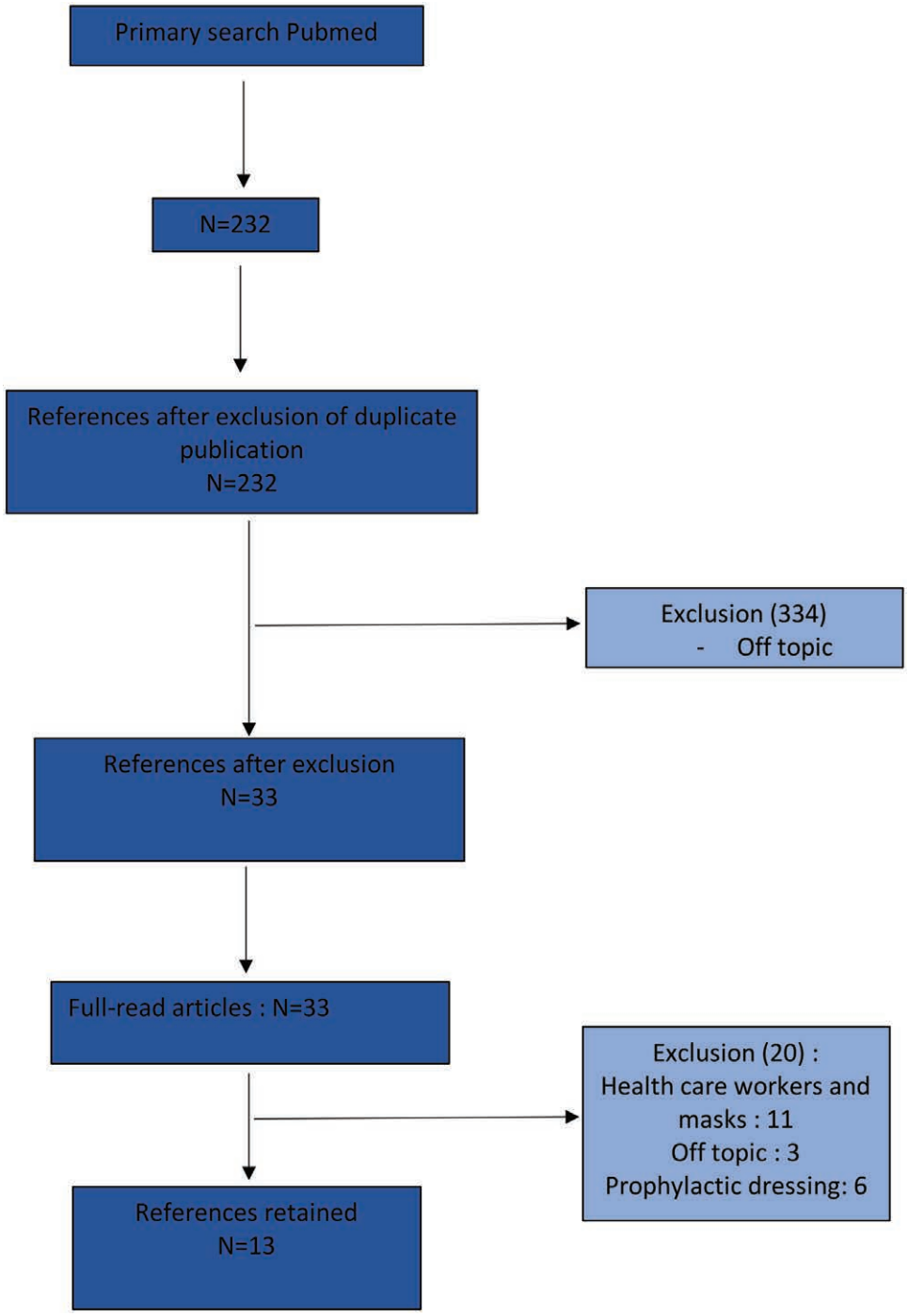

Fig. 1. Flow chart.

the prevalence of facial injuries on the face, chin, nose, and neck was around 45%. Jiang et al[11] noted several cases of ear necrosis in their study, although no precise incidence was provided. An unrecognized folding of the pinna was deemed to cause these lesions during PP.

LIPS

Pressure ulcers of the lips are a rare entity; they were described in six articles of our literature search.[10–13,16,21] They were mainly related to the endotracheal tube and its attachment. Lip ulcers usually respond to nonsurgical wound care.[21] However, Siotos et al[21] mentioned that surgical intervention could be necessary to control recurrent bleeding, especially as anticoagulation is often required in severe COVID-19 cases to avoid thromboembolic events.[22] In a study from Capasso et al,[16] lip injuries occurred in 18% of cases and were at most grade II lesions. However, the authors mentioned that prophylactic dressing, head

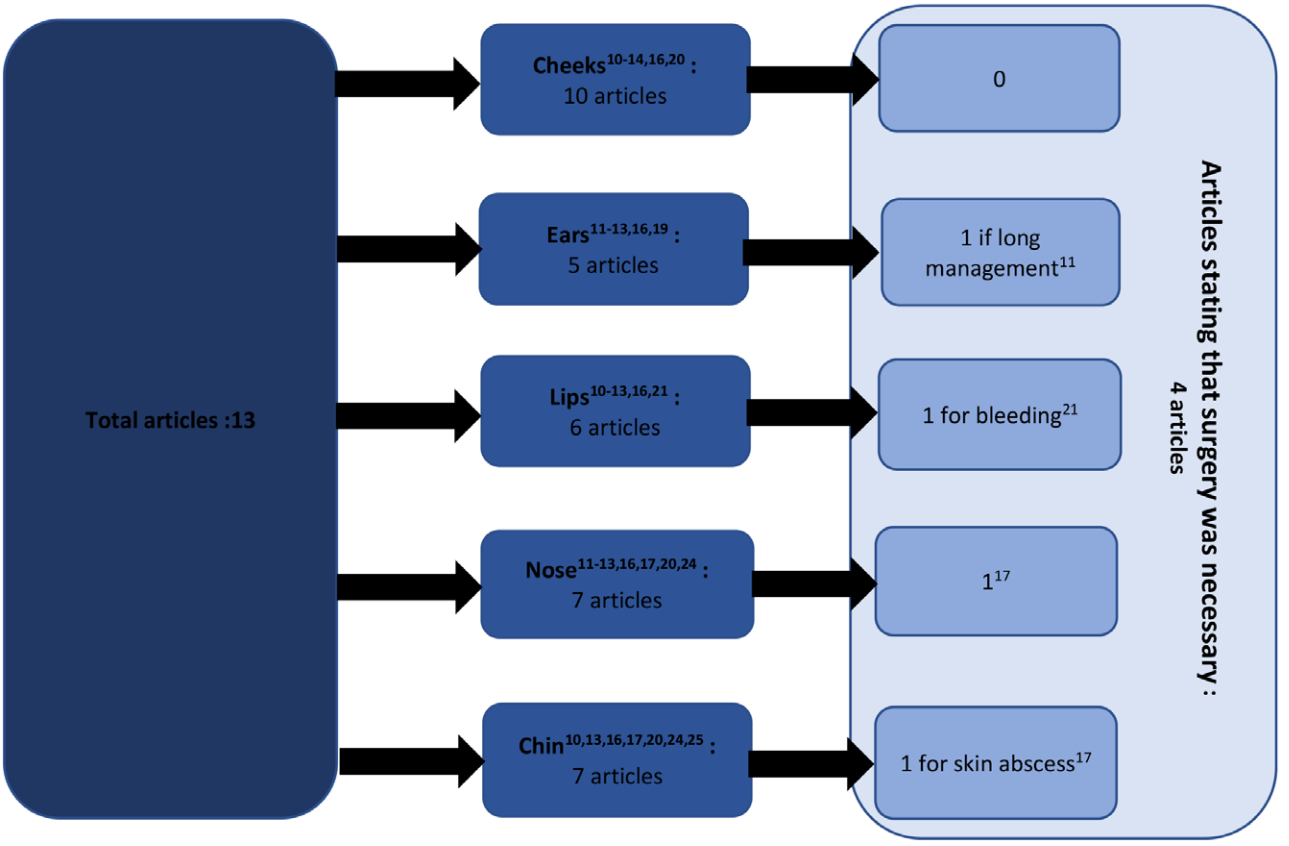

Fig. 2. Articles dealing with surgical treatments. The second column reveals the number of articles dealing with each site of facial pressure sore. The third column details the number of reports attesting to the need for surgery for these locations, whether for wound treatment, a complication, or long-term reconstruction.

rotation every 2 hours, and limiting PP duration should be encouraged to prevent these injuries. Yu et al[10] confirmed that lips are one of the main locations of pressure sores on the face with the chin and cheeks. The treatment of all those lesions consisted of chemical debridement of necrotic tissues. Shearer et al[13] described an incidence of lip injuries in 17.6% of 68 patients with PP facial injuries, none requiring surgical treatment.

NOSE

From accounts by patients and caregivers, nasal pressure injuries are the most frequent facial injuries due to COVID-19.[8] Prolonged wearing of NK95 or FFP2 masks can be responsible for nasal dorsum lesions. Prevention of such injuries can be achieved through foam or hydrocolloid dressings.[23]

Nasal sores in the context of COVID-19 were reported in seven publications.[11–13,16,17,20,24] According to Capasso et al,[16] 26% of facial sores were located on the nose or the nares, and almost a third were aggravated with deep tissue injuries. Ibarra et al[17] stated that alae nasi was one of the most common locations of facial injury (18% of cases). In their study, nasal lesions seemed deeper than other facial lesions, with two cases leading to surgical intervention. Double lumen nasogastric tubes put patients at risk for nostril lesions, but the duration of intubation did not seem to increase the risk of lesion.[17] Shearer et al[13] found a similar rate of nasal damage (17.6% of cases). Other authors[20,24] described cases of non-surgical PP-related nasal lesions, some of which occurred after less than 48 hours.

CHIN

Out of seven publications,[10,13,16,17,20,24,25] the prevalence of chin injuries varied from 7%[16] to 16%[17] of cases. Ramondetta[24] and Ayala[20] reported uncomplicated PP-related chin lesions that benefited from local care. Ibarra et al[17] reported a single case of bedside surgical drainage. Peko et al[25] considered the chin as one of the primary support regions of the prone head. In studies from Capasso[16] and Shearer,[13] no surgical treatment was described for chin sores. In their systematic review, Yu et al[10] also reported that the chin was one of the most affected facial locations.

CASE REPORT 1: NASAL LESION

A 61-year-old man with a history of gastroesophageal reflux was admitted to the ICU to manage acute hypoxic respiratory failure due to COVID-19 pneumonia in November 2020. The patient subsequently developed acute respiratory distress syndrome (ARDS), for which prone positioning sessions were completed for 5 days. The

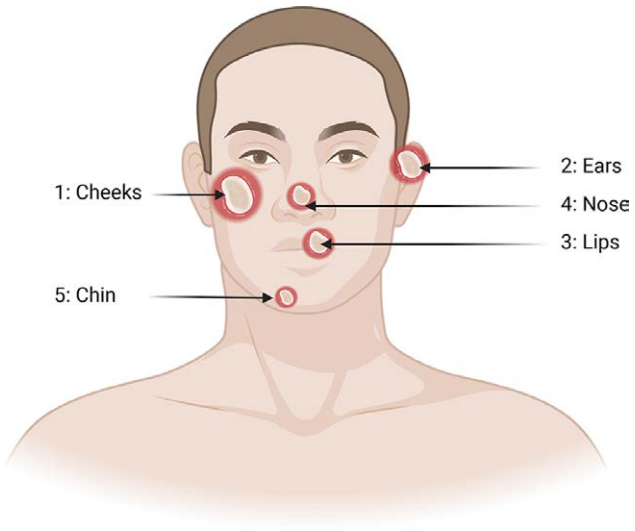

Fig. 3. Most frequent pressure sore sites on the face. Sites are presented by decreasing frequency—figure created with Biorender. Cheeks: 84% of all patients with head and neck pressure injuries among Shearer et al[13]; 24% among Ibarra et al[17]; most frequent location on the face among Gonzalez et al.[12] Ears: 50% of all patients with head and neck pressure injuries among Shearer et al[13]; most frequent site of pressure sores on the face among Capasso et al[16]; second most frequent site on the face among Gonzalez et al.[12] Lips: 17.60% of all patients with head and neck pressure injuries among Shearer et al[13]; 10% among Ibarra et al.[17] Nose: fourth most affected site on the face among Shearer[13] and Capasso.[16] Among Ibarra, this site represents 26% of facial pressure injuries. Chin: Varies from 8% to 9%[13,16] to 16%[17] in the literature.

patient recovered and was discharged from ICU 17 days later. He then experienced a nasal sore spreading to the nostril wings, dorsum, tip of the nose, and the columella (Fig. 4). There was no sign of nasal cartilage destruction. The reconstructive solutions discussed were a frontal flap described by Burgett[26] or a full-thickness skin graft. A full thickness skin graft harvested from the supraclavicular region was performed. At the 6-month follow-up, no dyschromia was observed, and there were no donor site sequelae; patient satisfaction was reached (Fig. 5).

CASE REPORT 2: CHIN LESION 1

A 62-year-old man with a medical history of high blood pressure, prostate hypertrophy, atrial fibrillation, and obesity with a body mass index of 33 was admitted to the ICU in April 2021 with severe SARS-CoV-2 pulmonary infection. He then developed septic shock due to pneumonia acquired under mechanical ventilation leading to the administration of vasopressors and prone ventilation sessions. After 6 days, the extracorporeal membrane oxygenation (ECMO) system was initiated to fight against multi-visceral failure. Acute kidney failure required dialysis following this episode. Tracheotomy was performed at 3 weeks, and the patient was discharged from ICU after 1 month. He then developed a severe chin sore that required surgical debridement, revealing a communication with the oral cavity (Fig. 6). A sub-mental flap[27] was used to cover the chin defect and to close the oral communication (Fig. 7). Four months after surgery, the patient

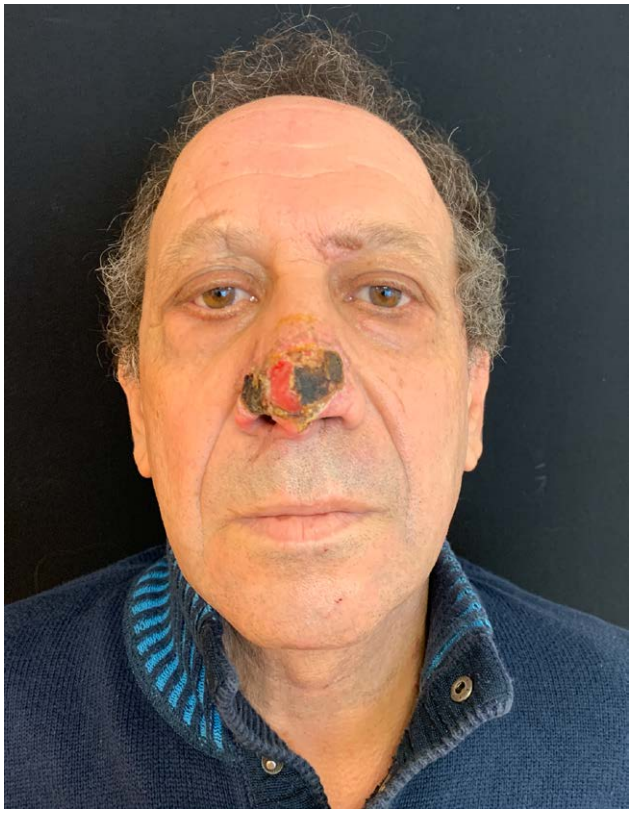

Fig. 4. Initial nasal injury.

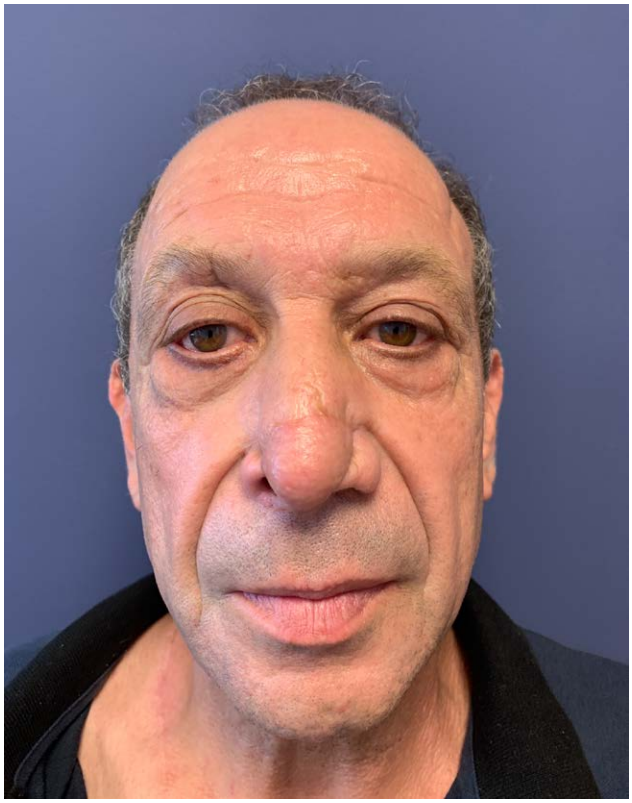

Fig. 5. Six months postoperative.

Fig. 6. Chin injury with oral communication.

experienced mild lower lip retraction and a hypertrophic scar (Fig. 8).

CASE REPORT 3: CHIN LESION 2

A 22-year-old man with no medical history was admitted to our hospital after being involved in a high-kinetic polytrauma in a traffic accident. The initial medical report showed a ruptured aortic isthmus treated with an endoprosthesis; anterior T2-T3 dislocated fracture and C7-T1 fracture treated with C5-T6 arthrodesis and C6-T3 laminectomy, a left per-trochanteric femoral fracture treated with nailing, clavicular fracture osteosynthesis, and a left ankle wound. After surgical treatment, the patient was extubated and stable on postoperative day 1. On day 4, the patient experienced respiratory failure and was diagnosed with COVID-19. The patient developed acute respiratory distress syndrome treated with mechanical ventilation through orotracheal intubation, prone ventilation sessions, corticosteroid therapy, antibiotherapy, anticoagulation, and vasopressors. After 3 weeks, the patient experienced a chin sore, for which alginate dressings were first advised. After repeated bedside debridement, the sore started to spread to the mandibular bone. Failure of a submandibular flap[27] led to a secondary reconstruction with an anterolateral thigh free flap[28] anastomosed on the facial vessels. Results at 5-month and 10-month follow-ups showed satisfactory outcomes, with no retraction and single revision surgery for flap defatting (Figs. 9–11).

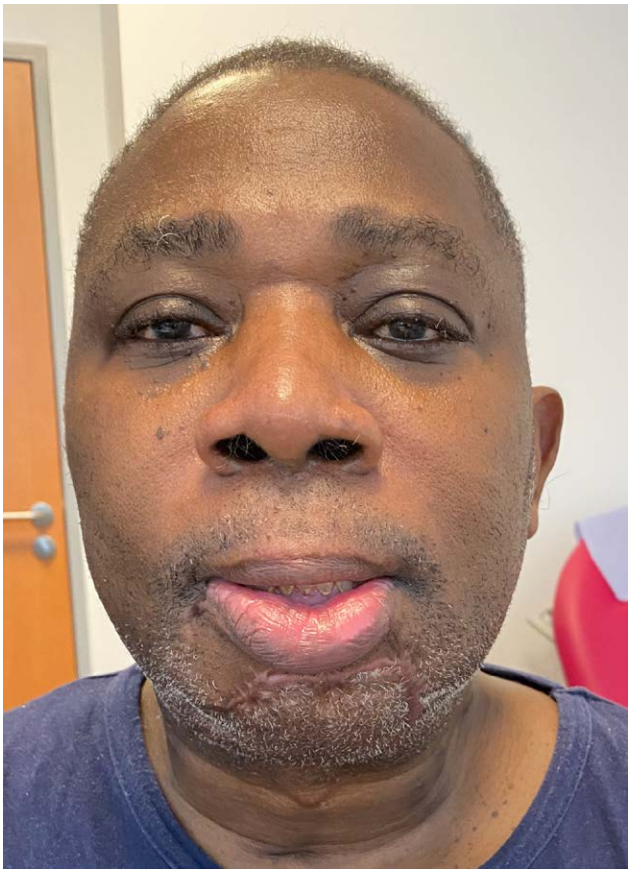

Fig. 8. Photograph showing the result at 4 months postoperative.

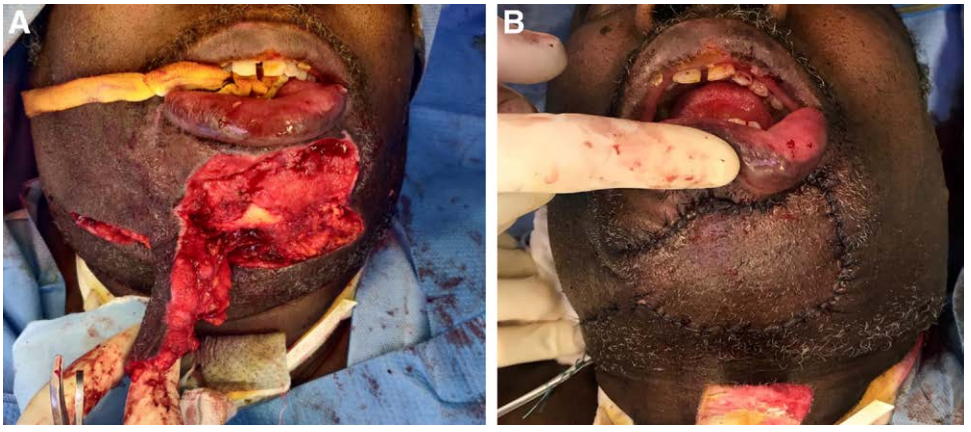

Fig. 7. Submental flap. A, Flap harvesting. B, Immediate postoperative.

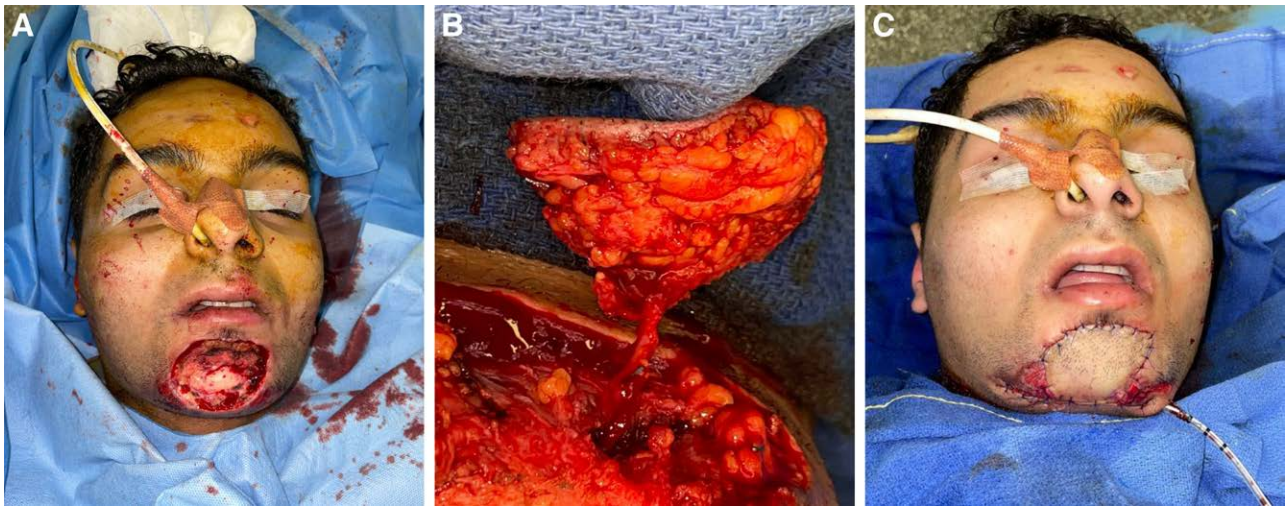

Fig. 9. Peroperative photographs. A, After debridement. B, Harvesting the submandibular Flap. C, Immediate postoperative.

Fig. 10. Results at 5 months after anterolateral thigh free flap.

DISCUSSION

Prone positioning ulcers are frequently observed in COVID-19 patients in ICU, with facial locations representing approximately 50% of the injuries.[13] Even though pressure ulcers were well-known complications for frail bed-ridden patients before the coronavirus breakthrough, those lesions were poorly described in the literature before the COVID-19 pandemic. Significant risk factors for developing facial pressure injuries have been identified; some remain controversial. Capasso et al[16] reported that male gender, use of norepinephrine, or Braden score 12 or below impacted the incidence of pressure injuries. In contrast, Ibarra et al [17] asserted that age, BMI, use of vasoactive drugs, and length of ICU stay did not influence the development of facial pressure ulcers. Shearer et al[13] and Gonzalez et al[12] determined that PP duration may promote the appearance of ulcers. Other highlighted risk factors were the presence of a respiratory device (endotracheal tube holder and taping[16]) and frictional and pressure forces[25] due to the contact between the skin and the surface below. Shearer et al[13] hypothesized that commercial endotracheal tube fasteners might produce greater vertical forces on the face, contributing to the development of facial pressure injuries. Yu et al[10] and Rastogi et al[14] also noted several cases of facial injury linked to the endotracheal attachment device.

Many authors described recommendations to avoid such facial ulcers: alternative head rotations, skin hygiene regimens, various cycles of prone positioning, and prophylactic dressings.[17,25] The key take-home message was that the prevention of facial ulcers is fundamental in wound treatment. Prophylactic dressings were discussed by several authors,[15,18,25,30,31] and methods varied from a simple hydrocolloid dressing or a sponge dressing to specific head support. New strategies have been adopted during the COVID-19 pandemic to prevent pressure injuries. Capasso et al[16] mentioned that an appropriate pressure redistribution protocol could reduce the risk of anterior pressure ulcers by 71%, face included. Using their method, only lower grade scores were reported. However, with the duration of the pandemic and team exhaustion, the frequency of care may be reduced. Maybe the creation of a team dedicated to sore prevention with surgeons and nurses could be efficient in the ICU.

Fortunately, in our literature search, most of the described facial pressure injuries were grade I or grade II[12] and responded well to local care. Douglas et al[19] suggested

Fig. 11. Results at 10 months after anterolateral thigh free flap. A, Profile; B, Frontal view.

that sacral decubitus wounds were more inclined to necessitate surgical treatment as their progression to grade 4 was more likely.

In the literature, the only facial locations surgically treated were the ears,[11] the lips,[21] the nose,[17] and the chin.[17] For each site, only one publication mentioned their surgical treatment, underlining the scarcity of indications. Four articles mentioned surgical therapy for pressure sores: one study promoted surgery in managing pressure sores,[17] two studies reported complications requiring surgical intervention,[17,21] and one other study alluded to secondary surgical reconstruction.[11] Even if surgery is not the first-line treatment, the necessity for later surgical revision cannot be excluded in case of dyschromia or retraction left on by stalled healing, especially for facial aesthetic subunits. Besides, facial scars acquired during an ICU stay for severe COVID-19 can yield lingering physical and psychological damage.[17]

Therefore, preventing facial ulcers is critical, and the utmost attention must be directed to initiating early wound care[17] and earmark surgery for complications such as bleeding or cellulitis.[17,21] In our experience, secondary surgical reconstruction of PP facial sores might be needed even though healing would eventually be achieved once the patient is out of ICU and the facilitating factor removed. Indeed, this case demonstrated that a full thickness skin graft (FTSG) is an excellent treatment for a sore grade I or II. Our nasal lesion case showed that lesser scarring could be obtained with a single-step FTSG. Our two other cases demonstrated that some lesions could use more complex surgical treatment; this has not yet been reported in the literature. A sore grade III or IV cannot be treated with an FTSG due to the bone exposure. A local flap can be preferred in first intention but in case of failure, it may be necessary to perform a free flap. Although an increased risk of coagulopathies has been described in COVID-19 patients, we did not face any thrombotic complications during or after free flaps. Indeed, free flaps were not performed during the acute phase of the disease but once the patients were out of ICU and without any evolving inflammatory syndrome.

On the financial aspect, the cost of prone positioning injuries was appraised at 1.3 billion dollars per year in the United States alone.[15] The rise in the use of prone positioning with the surge of severe COVID-19 pulmonary infections will most certainly result in an increased economic burden on a global scale, stressing the importance of prevention and early diagnosis of PP-related facial pressure sores during ICU stays again.[15]

CONCLUSIONS

Many patients treated for COVID-19 in ICU developed facial ulcers from prone positioning. Prevention of these lesions is crucial but often insufficient. In the literature, the primary treatment was local care with dressings. We believe that treatment of the sequelae from these injuries will lead to numerous surgical treatments ranging from skin grafting to staged reconstruction.

Alexandre G. Lellouch, MD, PhD
Department of Surgery
Division of Plastic and Reconstructive Surgery
Massachusetts General Hospital
Harvard Medical School
55 Fruit Street, Wang 435
Boston, Mass. 02114
E-mail: alellouch@mgh.harvard.edu

PATIENT CONSENT

The patients provided written consent for the use of their images.

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