ABSTRACT

Monkeypox is a contagious disease that manifests as a smallpox-like skin rash. The disease has shown a sudden surge worldwide across several countries. These patients may present for emergency surgery. Anesthetic management of these cases in an emergency setting is challenging. There is not much literature on the anesthetic management of monkeypox patients. We aimed to discuss the anesthetic management of monkeypox in this review.

Keywords: Anesthetic, monkeypox, peri-operative care, pox, surgery

Introduction

Monkeypox is a contagious disease caused by the monkeypox virus which belongs to the smallpox virus family. There has been a recent surge in the cases of monkeypox, and approximately 3,400 cases have been reported across more than 59 countries till June 28, 2022.[1] Monkeypox is characterized by typical manifestations of a distinctive skin rash that is similar to smallpox, especially on the face and extremities in 97-98% of cases. The currently spreading western strain of monkeypox has a reported mortality of 6.8%.[2,3] Smallpox vaccination is supposed to be more than 85% protective against monkeypox disease. But a majority of the young population is not immune to either of the diseases owing to the halt of routine smallpox vaccination among the public after it was declared eradicated on May 8th, 1980, whereas, older, formerly vaccinated people probably have insufficient protection.[4]

Peri-operative physicians usually have no experience with this disease due to the less frequent occurrence of monkeypox and the elimination of smallpox. In view of recent monkeypox outbreaks and widespread global spread, we present expected challenges and possible management strategies in the perioperative anesthetic management of monkeypox patients arriving in the operating room for emergency surgeries.

Search Strategy

A review of literature on Pubmed, Embase, and Scopus (as of June 28, 2022) reveals no literature in the English language, on perioperative and anesthetic management of a patient with monkeypox planned for emergency surgery. We used the searched Pubmed with the following search strategy: (((((monkeypox) OR (monkeypox)) OR (monkey-pox)) OR (pox)) OR (orthopoxvirus)) AND ((((((((((surgery) OR (surgical)) OR (anaesthesia)) OR (anesthetics)) OR (anesthesiology)) OR (anesthesia)) OR (anaesthetics)) OR (anaesthetists)) OR (anaesthetists)) OR (anaesthesiologists)) OR (anesthesiologists))

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OR (anesthesia) OR (anesthetic) OR (anesthetic) OR (anesthetic) OR (cesarean) OR (intubation) OR (neuraxial) OR (epidural)). This yielded 684 results which were screened for eligibility; of these, we shortlisted 38 relevant to anesthesia only, for reading the abstract. The articles were further read in detail and we shortlisted eight which were relevant to smallpox, chicken pox and monkeypox. Those were included for this review.

Exanthematous manifestations of monkeypox and relevant anesthetic challenges [Table 1]

**Extremities**

Painful exanthems are typical of Monkeypox and are seen on the face and extremities in 97-98% of the patients.[2] Extremities are common sites for securing intravenous (IV) access and blood sampling. The presence of multiple painful exanthems can hinder tying of tourniquet, identification of veins, cannulation, fixation of a cannula, and collecting of arterial or venous blood samples. Besides being painful, exanthems can also act as a source of infection for health care workers. Hence, lesion-free areas must be carefully looked for sampling, placement of cannulas, BP cuffs, SpO2 probe, and ECG electrodes, along with proper use of personal protective equipment by healthcare workers.

**Face**

Painful lesions are seen on the face in 98% of the patients (2). They can cause discomfort for patients during pre-oxygenation and bag and mask ventilation. This becomes especially important in patients with poor functional capacity and reduced cardiopulmonary reserve. Even with good sealing, bag and mask ventilation can generate droplets and act as a potential source of infection for health care workers. Adequate pre-oxygenation with 100% oxygen via a non-rebreathing mask or nasal cannulas covered with a simple face mask can be more comfortable for patients and safer for health care workers. Rapid sequence induction and intubation under an adequate depth of anesthetic and relaxation, with minimal or no mask ventilation, can be used for reducing aerosol generation.

**Oral exanthems**

56% of the patients affected with monkeypox have oral ulcers, and airway instrumentation can be hazardous in these patients due to the risk of resulting trauma, airway edema, and bleeding.[2] Endotracheal intubation appears to be safer than the placement of supraglottic devices, due to the advantage of lower risk of bleeding and aspiration. However, laryngoscopy and intubation can be challenging for anesthesiologists if there is bleeding from exanthems or scabs due to the pressure of the laryngoscope blade. Extrapolating the airway management is described in case reports of patients with an oral cavity full of lesions like...

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**Table 1: Clinical manifestations associated with anesthetic concerns in monkeypox and management**

| Manifestations              | Anesthesia concerns                                                                 | Suggested management                                                                 |
|-----------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Facial exanthems (98%)     | a) Discomfort to a patient due to the pressure of mask over painful lesions during preoxygenation. Difficulty in mask sealing. b) Generation of aerosols during Bag-Mask ventilation. | a) Pre-oxygenation with 100% Oxygen using NRBVM for 3-5 minutes. b) Rapid sequence induction and intubation |
| Extremities exanthems (97-98%) | a) Difficulty in cannulation, sampling, placement of BP cuffs, SpO2 probes, and ECG electrodes. b) Exanthems are a potential source of infection for HCW. | a) Careful placement in lesion-free areas b) Personal protective equipment as recommended by WHO (gloves, gown, eye protection, N95 respirators) |
| Oral exanthems (56%)       | a) Risk of trauma, airway edema, and bleeding during airway instrumentation b) Risk of bleeding and aspiration with supraglottic airway devices c) Anticipated challenges related to the difficult airway for general anesthetic. d) Respiratory droplets are a potential source of infection for HCW e) Risk of trauma and bleeding with intraoral temperature probes, oropharyngeal airways, supraglottic airway devices, and ryles tube instrumentation | a) Airway management by a senior anesthesiologist, gentle laryngoscopy, gentle suction, throat packing. b) Personal protective equipment as recommended by WHO (gloves, gown, eye protection, N95 respirators) |
| Trunk and back exanthems    | a) Risk of viral contamination of CSF with a neuraxial anesthetic. b) Trauma to skin and risk of infection at pressure points, specially at sites with lesions and ulcers | a) Avoid as much as possible. |
| Painful oral ulcer          | a) Decrease in oral intake and dyselectrolytemia                                      | a) Needling at lesion-free areas. Use of smaller gauze pencil tip spinal needles. Theoretical recommendation to avoid for the duration of viremia (21 days of onset of symptoms) b) Adequate padding, and aseptic precautions while handling | a) Analgesics, IV fluids if indicated. b) Monitoring of electrolytes, and assessment of fluid status during the pre-anesthetic check-up. |
| Generalized skin rash       | a) Skin exanthems are a potential source of infection for HCW b) Infection            | a) Personal protective equipment as recommended by WHO (gloves, gown, eye protection, N95 respirators) b) Educate the patient about not touching the lesion and scratching. Cover with light dressing if extensive lesion. | a) Aseptic precautions. Use of eye ointment, and taping b) Usually, self-limiting: Ophthalmology consults if symptoms persist or visual disturbance |
| Eye exanthems and conjunctivitis (25%) | a) Infection and vision loss                                                   | a) Aseptic precautions. Use of eye ointment, and taping b) Usually, self-limiting: Ophthalmology consults if symptoms persist or visual disturbance |
buccal pemphigus. We suggest that in patients of monkeypox presenting with buccal lesions, intubation should be performed by a senior and experienced anesthesiologist, using gentle direct or video laryngoscopy after gentle suction. Throat packing can with saline-soaked gauzes with or without adrenaline, to stop bleeding and prevent aspiration into the trachea.\textsuperscript{[5,6]}

In several case reports of skin diseases with oral ulcers, neuraxial or regional anesthetic has been described as a preferred anesthetic technique over general anesthetic, in view of anticipated challenges related to airway management.\textsuperscript{[7]} Needling for neuraxial and regional anesthetic should be done in a lesion-free area.

Intraoral temperature probes, oropharyngeal airways, supraglottic airway devices, and ryles tube placement should be avoided unless mandatorily required. The throat pack must be gently removed prior to extubation, and vigorous suctioning must be avoided.

**Eyes exanthems**

Eye ulcers are seen in 25% of the patients with smallpox.\textsuperscript{[8]} These lesions are severe and can result in blindness in patients. Thus, special care for eyes including the application of eye ointment and taping of eyelids in lesion-free areas should be done.

**Trunk and back exanthems**

Protection of pressure points using adequate padding, especially at sites of lesions, is recommended to avoid trauma to the skin. Local site lesions over or very near to the desired site of needle insertion may lead to inoculation of virus from exanthems into the CSF and is thus a relative contraindication for a neuraxial block. The risk of secondary infection in skin lesions warrants the following of strict aseptic precautions during patient care. Exanthems are contagious, and the virus can get transmitted from exanthems to health care workers through a breach in the skin if gloves are not worn properly.

**Concerns with spinal anesthesia for patients with monkeypox**

Lesions at back are common in monkeypox, and their presence at the site of needle insertion is a theoretical contraindication for a neuraxial block. There is a possibility of the introduction of the virus into the central nervous system by a spinal needle during the placement of subarachnoid block especially during the period of viremia, resulting in viral encephalitis/meningitis. Also, in the setting of post spinal headaches or neurological complications of spinal block, it might be difficult to differentiate from neurologic complications of the disease. However neurological manifestations of monkeypox have been found only in a few cases in the literature and none of them is in relation to anesthetic procedures.\textsuperscript{[9]}

The duration of viremia in monkeypox is documented to be 21 days from the onset of the rash.\textsuperscript{[9]} Thus, avoidance of neuraxial anesthetic for 21 days from onset of rash, appears to be a safer approach, if the buccal lesions are not extensive and difficult airway is not anticipated.

A neuraxial or regional anesthetic may be preferred in patients with lesion-free areas on the back, extensive buccal lesions, anticipated challenges related to airway management, or patients with monkeypox pneumonia. No data is available to determine the relative risk of airway complications or monkeypox pneumonia with a general anesthetic or the spread of the virus with a regional or neuraxial anesthetic. We suggest that meticulous neurological examination and monitoring should be done if a neuraxial anesthetic is administered.

In view of the evidence of tissue coring and spread of epithelial cells into epidural and intrathecal spaces with hollow spinal and epidural needles, we suggest the use of a pencil-point needle for spinal anesthetic in monkeypox disease, as it was suggested for patients with varicella-zoster virus, expecting reduced risk of introduction of the virus into the central nervous system.\textsuperscript{[10-12]} A theoretical advantage of epidural anesthetic over spinal anesthetic has been discussed owing to epidural needle not breaching the dura, but with the simultaneous potential introduction of larger viral load with large-sized and hollow epidural needles in patients with active viral diseases.\textsuperscript{[12]}

**Other specific concerns**

Dehydration and dyselectrolytemia can be present in patients with painful and extensive oral ulcers, owing to reduced intake. Thus, assessment of volume status and investigations like serum electrolytes are an important part of the pre-anesthetic check-up. Young age (\textless 8 years of age), pregnancy, immunocompromised status, and history of atopic dermatitis, or eczema are associated with a higher risk of severe monkeypox disease.\textsuperscript{[13]} Dermatology and infectious disease medicine liaison are important.

**Prevention of transmission to healthcare professionals:**

**Guidelines for vaccination, personal protective equipment (PPE), and patient isolation**

CDC recommends that patients with presenting symptoms of fever, chills, malaise, the distinctive rash (deep-seated, firm, or hard, well-circumscribed vesicles or pustules or scabs), or new onset lymphadenopathy, and history of travel to areas reporting monkeypox cases should be considered as...
a possible diagnosis. A high index of suspicion is warranted for male patients with an accompanying history of sexual contact with men and presenting with lesions in the genital or perianal area.

The disease can be transmitted by close contact, bodily fluids, respiratory secretions, and objects in contact with lesion crusts or body fluids like contaminated linens and bandages. Anesthesiologists and perioperative healthcare professionals need to practice extra caution during airway management, suction, laryngoscopy, and intubation, as they can get exposed to the virus through respiratory secretions and saliva. CDC suggests that healthcare workers must use personal protective equipment while providing care to symptomatic patients, as they are contagious in the rash stage of monkeypox. Recommended PPE for healthcare workers dealing with patients with monkeypox consists of a gown, gloves, eye protection (goggles or face shield), and NIOSH-approved respirators (N95 filters or higher). Intubation, extubation, or any procedure likely to spread secretions must be performed in an airborne isolation room. Patients with monkeypox need to be placed in single-occupancy rooms with a dedicated bathroom. Special air handling is not required. During transportation, patients should use well-fitting source control (e.g. medical mask) and cover exposed lesions with a gown or sheet.

Transmission of monkeypox in healthcare settings has been rarely described and the risk of monkey-pox for most front-line healthcare workers is low. Pre-exposure vaccination is not recommended for most healthcare workers. Monkeypox does not spread as easily as Covid-19 and proper use of personal PPE, hand hygiene (alcohol-based hand rub or soap and water), use of disposable medical gloves while changing bandages or handling contaminated linens, and infection control practices are effective in preventing transmission of monkeypox.

The limitation of this article is that these recommendations are not based on evidence-based medicine or randomized controlled trials owing to a less common occurrence of monkeypox disease until recently.

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References

1. Available from: https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON396. [Last accessed on 2022 Jun 28].
2. Whitehouse ER, Bonwitt J, Hughes CM, Lushima RS, Likafi T, Nguete B, et al. Clinical and epidemiological findings from enhanced monkeypox surveillance in Tshuapa province, democratic republic of the Congo during 2011-2015. J Infect Dis 2021;223:1870-8.
3. Bunge EM, Hoet B, Chen L, Lienert F, Weidenthaler H, Baer LR, et al. The changing epidemiology of human monkeypox: A potential threat? A systematic review. PLoS Negl Trop Dis 2022;16:e0010141.
4. Available from: https://www.who.int/news-room/fact-sheets/detail/monkeypox. [Last accessed on 2022 Jun 28].
5. Bansal A, Tewari A, Garg S, Kanwal A. Anesthetic considerations in pemphigus vulgaris: Case series and review of literature. Saudi J Anaesth 2012;6:165-8.
6. Mahalingam TG, Kathirvel S, Sodhi P. Anaesthetic management of a patient with pemphigus vulgaris for emergency laparotomy. AnaesthesiaAnesthetic 2000;55:160-2.
7. Kadota Y, Kawaguchi Y, Kawasaki K, Toubou K, Kamamura Y. Perioperative management of a patient with systemic lupus erythematosus, myasthenia gravis, and pemphigus foliaceus. Masui 2001;50:1221-3.
8. Ogoina D, Irozindu M, James HI, Oladokun R, Yinka-Ogunleye A, Wakama P, et al. Clinical course and outcome of human monkeypox in Nigeria. Clin Infect Dis 2020;71:e210-4.
9. Available from: https://www.aabb.org/docs/default-source/default-document-library/regulatory/eid/130s.pdf?sfvrsn=652b9f22_2. [Last accessed on 2022 Jun 28].
10. Oznyurt G, Mơglob EB, Toluay S, Kerimoğlu B. Tissue coring with spinal needles. RegAnesth Pain Med 2000;25:665.
11. McDonald JV, Klump TE. Intraspinal epidermoid tumors caused by lumbar puncture. Arch Neurol 1986;43:936-9.
12. Brown NW, Parsons AP, Kam PC. Anaesthetic considerations in a parturient with varicella presenting for Caesarean section. AnaesthesiaAnesthetic 2003;58:1092-5.
13. 2022 Monkeypox: Information for Healthcare Professionals | Monkeypox | Poxvirus | CDC Monkeypox recommendations for Healthcare Professionals. Available from: https://www.cdc.gov/poxvirus/monkeypox/response/2022/hcp/index.html. [Last accessed on 2022 Jun 28].
14. Infection Control: Healthcare Settings | Monkeypox | Poxvirus | CDC. Available from: https://www.cdc.gov/poxvirus/monkeypox/clinicians/infection-control-healthcare.html. [Last accessed on 2022 Jun 28].