COVID-19 and Neurosurgery

- Global, regional, and national trends in ischaemic stroke burden and risk factors among adults aged 20 + years (1990-2021): a systematic analysis of data from the Global Burden of Disease study 2021 with projections into 2050
- The interaction of COVID-19 and sociodemographic factors on pediatric rehabilitation service initiation
- COVIVA: Effect of transcutaneous auricular vagal nerve stimulation on fatigue-syndrome in patients with Long Covid - A placebo-controlled pilot study protocol
- Development of anti-NMDA receptor encephalitis in a patient with multiple sclerosis
- Need for awareness and surveillance of long-term post-COVID neurodegenerative disorders. A position paper from the neuroCOVID-19 task force of the European Academy of Neurology
- The relationship between COVID-19 and stroke and its risk factors, a Mendelian randomization analysis
- Technical Optimization of SyntheticMR for the Head and Neck on a 3T MR-Simulator and 1.5T MR-Linac: A Prospective R-IDEAL Stage 2a Technology Innovation Report
- Relationship between Commuting Distance Using Public Transportation and the Risk of SARS-CoV-2 Infection in Healthcare Workers in Japan: A Cross-sectional Study

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Key Considerations

1. General Impact on Neurosurgical Practice

Elective surgeries were postponed or cancelled during pandemic peaks to prioritize ICU beds and resources.

Emergency cases (e.g., trauma, ruptured aneurysms) continued, often with modified workflows.

Shift toward telemedicine for outpatient follow-up and triage.

2. Preoperative Screening and Protocols

Mandatory RT-PCR testing before surgery.

Chest imaging (CT or X-ray) used in urgent settings when COVID status was unknown.

Use of COVID-free pathways or zones in hospitals to protect non-infected patients and staff.

3. Intraoperative Precautions

Full PPE for surgical teams, especially during aerosol-generating procedures (e.g., intubation, transnasal approaches).

Preference for non-transnasal routes (e.g., craniotomy over endonasal approaches) when feasible, due to high viral loads in the nasopharynx.

Minimal personnel in the OR to reduce exposure risk.

4. ICU and Postoperative Care Challenges

ICU beds are often occupied by COVID-19 patients, limiting access for postoperative neurosurgical patients.

Difficulty in postoperative rehabilitation due to staff reallocation and infection control measures.

5. Special Considerations

Stroke and COVID-19: Hypercoagulability increased the risk of cerebrovascular complications.

Neuro-COVID: Some patients developed encephalopathy, anosmia, or Guillain-Barré–like syndromes requiring neurology/neurosurgery input.

Management of oncological cases (e.g., gliomas, metastases) had to balance urgency with COVID risk.

6. Education and Research

Resident training was affected due to reduced surgical volume and rotations.

Surge in virtual learning and remote conferences.

Ongoing research into neuroinvasion by SARS-CoV-2, long-term neurological sequelae, and impact on brain tumors.

7. Ethical and Logistical Dilemmas

Triage of neurosurgical cases under resource scarcity.

Informed consent modified to include COVID-19-related risks.

Patients presenting with neurosurgical emergency should be considered as persons under investigation (PUI) and thus maximal personal protective equipment (PPE) should be donned during interaction and transfer. Intubations and extubations should be done with only anesthesia staff donning maximal PPE in a negative pressure environment. Operating room (OR) staff should enter the room once the air has been cleared of particulate matter. Certain OR suites should be designated as covid ORs, thus allowing for all neurosurgical cases on covid/PUI patients to be performed in these rooms, which will require a terminal clean post procedure. Each COVID OR suite should be attached to an anteroom which is a negative pressure room with a HEPA filter, thus allowing for donning and doffing of PPE without risking contamination of clean areas.

Conclusion: Based on a multi-institutional collaborative effort, we describe best practices when providing neurosurgical treatment for patients with COVID-19 in order to optimize clinical care and minimize the exposure of patients and staff [1)].

In every country, all surgical plans have been modified. In Wuhan, the staff was enrolled in COVID-units. In New York, the Mount Sinai Hospital Health System was in lockdown mode. In South Korea, sterilizing chambers have been placed. In Italy, some Departments were reorganized in a Hub and

Spoke fashion. In the Latin American region, they adopted special measures for every case. In the UK a conference center has been used to accommodate intensive care unit (ICU) beds. The third part was about neurosurgical practice during the COVID-19 pandemic. In Wuhan, the main hospital was used for urgent non-COVID patients. In New York, the neurosurgeon staff works in ICU as an advanced practitioner (APP). In South Korea, every patient is screened. In Italy, the on-duty Hub neurosurgeons have been doubled. In the Latin American region recommendations have been developed by some neurosurgical societies. In the UK local non-specialists and rheumatologists, neurosurgical experts are collaborating in terms of best practice. The final part touched upon how to perform safe surgery and re-start after the pandemic. In China, elective surgical procedures are performed very carefully. In New York, surgery planning will be based on the patient's viral load. In South Korea and in Italy disinfection plans and negative-pressure O.R. were created. In the Latin American region, the aim is to have a rapid testing system. In the UK they have developed flowcharts to guide trauma patient management.

In general, the pandemic scenario was presented as a thought-provoking challenge in all countries which requires tireless efforts for both maintaining emergency and elective neurosurgical procedures [2)].

Impact of COVID-19 on the Neurosurgical Resident Training Program

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Clinical pathway

One of the challenges neurosurgeons are facing in the global public health crisis caused by the COVID-19 pandemic is to balance COVID-19 screening with timely surgery. Lee et al. described a clinical pathway for patients who needed emergency brain surgery and determined whether differences in the surgery preparation process caused by COVID-19 screening affected clinical outcomes.

During the COVID-19 period, patients in need of emergency brain surgery were managed using a novel standardized pathway designed for COVID-19 screening. They conducted a retrospective review of patients who were hospitalized through the emergency room and underwent emergency brain surgery. A total of 32 patients who underwent emergency brain surgery from February 1 to June 30, 2020 were included in the COVID-19 group, and 65 patients who underwent surgery from February 1 to June 30, 2019 were included in the pre-COVID-19 group. The baseline characteristics, disease severity indicators, time intervals of emergency processes, and clinical outcomes of the two groups were compared. Subgroup analysis was performed between the immediate surgery group and the semi-elective surgery group during the COVID-19 period.

There were no significant differences in baseline characteristics and severity indicators between the pre-COVID-19 group and COVID-19 group. The time interval to skin incision was significantly increased in the COVID-19 group ($P = 0.027$). However, there were no significant differences in the clinical outcomes between the two groups. In subgroup comparison, the time interval to skin incision was shorter in the immediate surgery group during the COVID-19 period compared with the pre-COVID-19 group ($P = 0.040$). The screening process did not significantly increase the time interval to

classification and admission for immediate surgery. The time interval to surgery initiation was longer in the COVID-19 period due to the increased time interval in the semi-elective surgery group ($P < 0.001$).

They proposed a clinical pathway for the preoperative screening of COVID-19 in patients requiring emergency brain surgery. No significant differences were observed in the clinical outcomes before and after the COVID-19 pandemic. The protocol they described showed acceptable results during this pandemic [3].

Role

see Role of Neurosurgeons in the COVID-19 Pandemic.

While neurosurgeons are not on the frontline of COVID-19 management and treatment, they commonly care for critically ill patients who will continue to present with subarachnoid hemorrhages, subdural hematomas, brain tumors, traumatic brain injuries, spinal cord injuries, and compressive myelopathies while the pandemic occurs. While public health measures such as quarantine and social distancing are proving effective at slowing the spread, [4] [5] surgeons remain in direct contact with their patients throughout their operations. Protecting the surgical team from contracting COVID-19 is of utmost importance as they are both a potential vector for patient contamination and a scarce resource that cannot be easily replaced.

COVID-19 appears to be principally spread, either directly or via fomites, through droplets from respiratory epithelium— especially the upper respiratory tract. Blood is not at this point a recognized vehicle; if the significant virus were present in the blood, we would be able to do a blood test for the disease. Similarly, it does not seem to concentrate on the cerebrospinal fluid. Thus, most neurosurgical procedures to the spine and head should be safe with routine face and eye protection if Personal protection equipment is unavailable.

Recommendations

COVID-19 recommendations for neurosurgeons.

COVID-19 in chronic subdural hematoma

COVID-19 in chronic subdural hematoma.

COVID-19 and Intracerebral Hemorrhage

COVID-19 and Intracerebral Hemorrhage

Subarachnoid hemorrhage and COVID-19

see Subarachnoid hemorrhage and COVID-19.

Pituitary Surgery During Covid-19

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New York City

In an Invited Commentary, Ammar et al. describe their experiences and share lessons learned regarding triage of patients, staff safety, workforce management, and the psychological impact as they have adapted to a new reality in the Department of Neurosurgery at Montefiore Medical Center, a COVID-19 hotspot in New York City. Department of Neurosurgery at Montefiore Medical Center, a COVID-19 hotspot in New York City [6].

Italy

see COVID-19 in Italy.

Switzerland

Switzerland neurosurgery is doing, where urgent or elective cases are performed in a separate location, and providers and patients require negative COVID-19 tests and chest radiographs prior to entry. Furthermore, there would be greater demand for rapid data analysis and iterative systems research to ensure the best neurosurgical practices [7].

COVID-19 and central nervous system

COVID-19 and central nervous system.

Emotional impact

The emotional impact of COVID-19: from medical staff to common people was published by Montemurro from the Department of Neurosurgery, Azienda Ospedaliera Universitaria Pisana (AOUP), Pisa, Italy [8].

Neurosurgery in an infant with COVID-19

Administering general aneasthesia to infants with respiratory infections is a challenge because aneasthetic drugs suppress immunity and can thus contribute to intubation-related mechanical stress and inflammation. Neurosurgery in infants with coronavirus disease 2019 (COVID-19) therefore poses a dilemma because the infection is associated with relative immune suppression and a dysregulated inflammatory response, which act as drivers of the disease [9)].

From Milan, Italy, we report the case of an 8-month-old male patient with a complex hydrocephalus who had a shunt malfunction during the COVID-19 pandemic. The infant presented with a mild temperature, a dry cough, and an occipital cerebrospinal fluid collection, suggestive for shunt malfunctioning. Neurological examination was negative, but the infant deteriorated and vomited repeatedly. The head CT scan indicated a shunt disconnection. A chest x-ray was negative for overt interstitial pneumonia and the nasopharyngeal swab tested positive for severe acute respiratory syndrome coronavirus [10)]

While the baby showed upper respiratory symptoms due to COVID-19, concerns emerged regarding the need for general anaesthesia for shunt revision. To our knowledge, no reports exist regarding the risk of general anaesthesia in infants with COVID-19. Nevertheless, considering the certainty of progressive neurological deterioration if no intervention was taken, the neurosurgical intervention was arranged.

According to the available protocols for patients with COVID-19, [11)]

a negative pressure operating room was set up. The staff were provided with full-head hoods, eye protection, filtering facepiece 3 masks, fluid-resistant gowns, double long-sleeved gloves, and impermeable disposable shoe covers. Surgeons and scrubbing nurses had additional sterile surgical suits and an additional pair of long-sleeved gloves. The patient was transferred from a ward dedicated to patients with COVID-19 to the surgical theatre through an isolated and restricted area by trained personnel wearing protective gear [12)] Surgery lasted approximately 1 h, and the infant recovered from general anaesthesia promptly. 4 days after surgery, vomiting had worsened and a second neurosurgical revision of the shunt was done. Again, the baby underwent surgery under general anaesthesia without respiratory complications. The baby was promptly extubated, and the neurosurgical course was favourable. To the best of our knowledge, this is the first reported case of an infant with COVID-19 undergoing neurosurgical operations under general anaesthesia. This case might reflect a general observation of relative resistance of babies and children to COVID-19, [13)] suggesting the possibility that paucisymptomatic infants with COVID-19 can undergo major surgical procedures without additional morbidity. This early case report needs confirmation and extension and might have broader implications for other surgical procedures addressing potentially life-threatening conditions in infants [14)].

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