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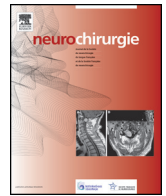


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From the editorial board

How SARS-CoV-2 is forcing us to reconsider and reorganize our daily neurosurgical practice



1. Introduction

The explosion of the COVID-19 pandemic is demonstrating that Far Eastern countries are not that far, reminding us how the entire globe is fragile and interdependent. More than any other previous outbreak in recent times, this new virus, called SARS-CoV-2, has forced the medical community to accept a new paradigm, which can be paraphrased as “All we know is we really don’t know”.

In this context, we would like to share our experience from Strasbourg, in the heart of Alsace, one of the hardest-hit regions in France, and describing how the neurosurgical work-pattern has drastically and abruptly changed in the attempt to cope with this international crisis. Late February 2020, our region started to witness the dramatic spread of SARS-CoV-2 in Europe, with an exponential increase in the number of infected patients, who progressively developed clinical signs of COVID-19.

2. How are we organizing and coordinating?

The French ‘Grand Est’ Region includes 5 large regional university hospitals (Strasbourg, Nancy, Besançon, Dijon and Reims) and one non-teaching hospital (Colmar), all operating under the coordination of a local interconnected crisis unit. In the Grand Est Region, with a total catchment of 6 million, there are 6 neurosurgery departments with 30 certified neurosurgeons and 18 neurosurgery trainees.

Very early in the pandemic, our politicians and managers were obliged to redirect resources to frontline healthcare professionals and to shrink elective practice in favor of emergency management of patients with severe pneumonia, who increasingly tested positive for SARS-CoV-2.

So far, the most effective action to slow down the spread of the virus in our communities has been social distancing. Nevertheless, the healthcare sector had to adapt to the surge of infections by diverting human and technological resources from many specialties towards overwhelmed intensive care units (ICUs).

Our hospital crisis authority decided firstly to send home all frontline doctors and nurses (emergency departments, ICUs, infectious diseases departments, etc.) aged more than 65 years, or those aged more than 60 years affected by relevant co-morbidities. Secondly, a call for volunteers was launched, and these new forces were directed toward the frontline or, in case of retired specialists without comorbidity, employed in ‘behind-the-line’ tasks: i.e., vital logistic activities including planning, organizing,

monitoring services, conducting telemedicine consultations, and providing call-center coordination across the region. It soon became common knowledge that this unforeseen event was going to tremendously disrupt not only our neurosurgical practice but also that of our allied specialties, such as ENT, ortho-spine, oncology, radiation therapy, etc.

Starting from March 13th, all departments in our hospital promptly reorganized on-call rotas, enforced new triaging protocols to identify patients requiring non-deferrable neurosurgical intervention and cancelled elective procedures so as to free up ventilators and anesthetists. All these measures had been previously adopted in many other countries, such as China and Italy [1,2]; however, our ethos and some internal and external actions account for the particularities of our response to the crisis, and we believe that those actions deserve reporting in order to enrich the literature about best practices, which might in turn serve as examples for areas around the world where COVID-19 has not hit yet.

3. Our ethos and actions

Any crisis requires a great deal of adaptability to constantly changing pressures (availability of beds, staff, equipment, supplies, etc.), and our strategy was always to reach a team-shared agreement regarding the right balance between practical choices and ideal adherence to state-of-the-art practice. In fact the first and foremost goal of each of our actions has been to keep providing a high standard of care without our standards being compromised by the implementation of a strict, cold, mathematical practice of military triage. In other words the values and beliefs, enrooted in our healthcare system and cultural background, led us to prioritize quality of care at all times.

Implemented actions: externally, we took full advantage of all the potentialities of our national and international network and leveraged on helicopter evacuation of cases that risked saturating our capacity. In fact, the geographical characteristics of our region and the strong bond with other units allowed us to transfer critical patients a few kilometers away to Germany, a country with more ICU beds available, and to other centers in our region where elective neurosurgical practice had not been disrupted as much as in Strasbourg.

Internally, we had to face difficult choices due to the intense competition for surgical theaters between multiple specialties, the constant influx of neurosurgical emergencies and, last but not least, the need to keep up with our centralization of

Table 1
Grading neurosurgical interventions.

Class	Type of Intervention	Management
Emergency (EM group)	Head/spine trauma, intracranial bleeding (due to ruptured vascular malformation), acute hydrocephalus, and head/spine oncologic cases with rapid onset of medically refractory intracranial hypertension or risk of permanent neurological deficit	No need for swab prior to surgical intervention
Deferrable (UP group)	Head/spine oncology cases showing slowly progressive neurological deficit responding to steroid therapy (e.g., high-grade glioma, brain metastasis, meningioma, pituitary adenoma, etc.). Large disc herniation with impending cauda equine syndrome	Management after swab, surgical intervention deferrable at least 48 hours, and expedited within 7–15 days
Elective (EL group)	Any benign tumor or other pathology not causing irreversible neurological deficit or putting patients in jeopardy	Management after swab, surgical intervention re-scheduled within 2–4 months

neuro-oncology cases. A list distinguishing emergency and deferrable surgical procedures was created (see [Table 1](#)), and the latter were cancelled from our surgical program to be tentatively rescheduled within 2–4 months. To increase the number of ventilators available for critically ill patients, our hospital downsized surgical activity and adopted a sharing schedule with only 3 operating theaters out of the 32 kept running. One theatre was dedicated to urgent COVID-19 patients, one to urgent non COVID-19 confirmed patients (24/7), and one to 48-hour-deferrable patients (a.k.a. UP-urgent procedure-Group, see [Table 1](#)). Although, in Strasbourg, we ensured a tight compliance with the “Recommendations on Elective Surgery” for negative patients and “Practice Management” for COVID-19 patients published by the World Health Organization and the French Ministry of Health, we rapidly realized that a prompt reorganization of our standard operating protocols was also required. On the one hand, we treated all those patients requiring prompt surgical intervention as if they were positive; full personal protection equipment (PPE) consisting of FFP2 tight facemasks, visors, double gowning and triple gloving was religiously adopted. On the other hand, we meticulously tested all new admissions amenable for 48-hour deferral, and awaited the results of their swabs before taking them to theatre. Of note, in the consent form for confirmed COVID-19-negative patients admitted to our hospital we added the risk of: a) infection with SARS-CoV-2, and b) medical complications related to severe clinical manifestations of COVID-19.

Furthermore, a well-standardized telemedicine system allowed comprehensive discussion with patients and their relatives regarding management options and informed consent; the consent process proved particularly useful in shielding elderly people and limiting their inpatient stay to the strict minimum.

Together with those measures, the management of patients with newly diagnosed space-occupying lesions is noteworthy. For them, we decided to rely heavily on metabolic and spectroscopic imaging as a surrogate for initial diagnosis whenever surgical biopsy under local anesthesia was unfeasible. This was agreed by all the members of our multidisciplinary neuro-oncology team and discussed with our ethics board. The scientific literature shows that biosignatures and 3-Tesla MRI with spectroscopic analysis of multiple regions of interest can be highly reliable [3–5], but no randomized studies have ever compared their safety and effectiveness versus standard-of-care surgical biopsy, and no proof of validity for this approach

exists. This said, our approach is in keeping with the preliminary experience and suggestions made by colleagues in the United States and Canada [6–8].

4. A dedicated COVID-19 ethics board

What greatly helped us was the creation of a dedicated SARS-CoV-2 ethics board in our hospital, which has played and is still playing a crucial role in helping, guiding and strongly orientating all practitioners during their clinical decision-making. We believe that the constant discussion with our COVID-19 Ethics Board helped us greatly in always respecting the patients and their dignity, while keeping a holistic medical approach. Thanks to rigorous clinical and ethical crosstalk on a daily basis, we were able to select which oncology and spine cases required transfer to other units, preserving the high quality of care expected by our patients. This approach yielded clinical and logistical advantages: despite the pandemic, patients still received gold-standard treatment, and only a few UP Group patients required transfer elsewhere if deferred surgery could not be undertaken in Strasbourg. This approach also optimized the use of surgical resources in the entire region, keeping theater down-time to a minimum.

Finally, it should be noted that, in a very few instances, the impossibility of proceeding with timely radical resection led to a discussion of risk/benefit ratios and futility of care within our COVID-19 Ethics Board. Poor baseline performance status and presence of multiple comorbidities or metastatic disease, etc. forced us to consider and at times also accept radiotherapy/radiosurgery and long-course chemotherapy as the sole viable alternative.

Finally, anticipating the possible medico-legal consequences of the crisis and to ensure accountability in all our decisions, our neurosurgical department established a COVID-19 period “Registry”, which hopefully will enable us to monitor the clinical progression of our patients and provide data for better understanding the impact of the pandemic on our surgical practice.

5. The future

Although it is still too early to draw any conclusions, we can certainly start making few observations. The most important one is that the organization described above is likely sustainable for only a few months, and prompt reassessment should be planned in case the pandemic continues into 2021 and beyond. Of course, neurosurgeons in France and all over the world should keep their practice as fluid as possible while facing the current critical scenario, where continuous adjustments will progressively be implemented. As a team, we are deeply convinced that the key to success is to expedite close cooperation between specialties, at local and, if necessary, regional, national and international levels, with well-structured coordination. Furthermore, we believe that accurate recording of the events that will unfold in the next months, through scientific publications reporting data from registries (such as the one set up in Strasbourg mentioned above), audits, and morbidity and mortality meetings, will serve as an observatory for future generations of neurosurgeons. When planning for the post-pandemic stage, we must not forget all the devastating psychological, social and financial consequences we are going to be confronted with in the near future. This will not be just a political or leadership issue: clinically, it will oblige us to facilitate the flow of tracheostomy patients and some ventilated patients out of our high-dependency unit (Unité de Soins Intensifs et Continus); to do so we are already envisaging the creation of a new environment, the Post-ICU Rehabilitation Unit (Soins de Reeducation Post Reanimation: SRPR), to host all patients awaiting transfer to traditional rehabilitation centers. While this

strategy has the drawback of only minimally reducing bed capacity in the neurosurgical ward, it will have several practical advantages:

- rebooting surgical activity by creating new ICU beds;
- streamlining inpatient/outpatient pathways, with rapid referral to rehabilitation units;
- strengthening our bond and cooperation with ICU specialists and all other surgical specialties in our hospital.

6. Conclusion

If anything, COVID-19 has brought our clinical and managerial workforce together to discuss, share ideas, and work together to optimize all available resources and cope with this devastating crisis. We believe that we are getting the best out of each other, and in the next few months we should be able to leverage this experience to relaunch routine elective practice. In the meantime, a long-term plan is particularly needed: it seems that only a minority of the French population has already been in contact with SARS-CoV-2, and we are worried that a second wave might be around the corner. Hence, an alternative setup to avoid any further radical disruption of our service is definitely warranted.

Disclosure of interest

The authors declare that they have no competing interest.

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