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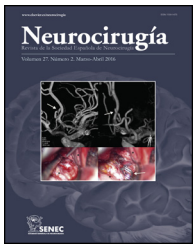

Opinion article

Endoscopic endonasal surgery during COVID-19 pandemic: Management guideline☆

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ABSTRACT

Current SARS-CoV-2 coronavirus pandemic is challenging medical and surgical activities. Specifically, within neurosurgery, endoscopic endonasal approaches pose a high risk of contagion for healthcare personnel involved in it. Initially, the recommendation was to avoid such surgeries. However, the pandemic has dragged on and new solutions must be proposed to continue carrying out these approaches safely. Given the lack of established protocols, we propose the following one, which concisely establishes the measures to be taken in both urgent and scheduled surgery. In addition, a new protection-aspiration device (Maskpirator) is described.

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Cirugía endoscópica endonasal durante la pandemia COVID-19: protocolo de actuación

Palabras clave:

SARS-CoV-2
COVID-19

RESUMEN

La actual pandemia por coronavirus SARS-CoV-2 está planteando una serie de desafíos al modo en que ejercemos la actividad médica y quirúrgica. En concreto, dentro de la neurocirugía se ha visto que los abordajes endoscópicos endonasales suponen un elevado riesgo de contagio para el personal sanitario que interviene en la misma, por lo que, inicialmente,

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Base de crCirugía endoscópica
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Protocolo

la recomendación fue evitar dichas cirugías. Dado que la pandemia se ha extendido en el tiempo y desconocemos cuándo se podrá controlar, se deben proponer nuevas soluciones para continuar con la realización de dichos abordajes de manera segura. Ante la falta de protocolos establecidos, planteamos el siguiente, en el que se establecen, de modo conciso, las medidas a tomar tanto en cirugía urgente como programada, además de la descripción de un nuevo dispositivo de protección-aspirado (Maskpirator).

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Introduction

Coronavirus disease 2019 (COVID-19) currently represents a threat to the health of the global population. Since it appeared in Wuhan (China) in December 2019, it has spread exponentially around the world. On 12 March 2020, the World Health Organization (WHO) declared it a pandemic[1]. By 24 October 2020, more than 42 million cases and more than 1 million deaths had been reported to the WHO[2]. There was a documented drastic increase in new cases in October, representing the so-called s̈econd wave.̈

This extraordinary situation, the duration of which cannot be determined, raises a number of challenges for ensuring the continuity of medical and surgical activities with as little risk as possible. In fact, although healthcare workers account for less than 3% of the population of most nations, more than 15% of people infected with the virus that causes COVID-19 belong to this group[3]. This alarming statistic has prompted the development of strategies to increase the safety of healthcare activities[4]. In particular, various studies have found that procedures on areas such as the respiratory tract, including the nasal cavity, rhinopharynx and oropharynx, carry a high risk of transmission to the professionals who perform them[5]. This is due to the high viral load in these areas and the risk of droplets and aerosols being produced[1,5].

In neurosurgery and otorhinolaryngology, a number of published articles warn of the risk of infection of the staff present in the operating theatre during endoscopic endonasal skull base surgery[6,7]. Hence, the prevailing recommendation at the start of the pandemic was to avoid such an approach and opt for craniotomy in emergency cases[8]. However, given the prolonged duration of this pandemic, the possibility of resuming these procedures as safely as possible for all staff involved should be considered.

Various recommendations on the management of patients in whom endoscopic endonasal surgery is proposed have been published[1,5,7,9]. However, there is no universally applied consensus protocol that makes it possible to clearly determine the best approach to take. This prompted us to prepare a protocol for action – based on the literature that exists at present, recommendations from scientific associations, and expert opinion – that distinguishes between two possible scenarios: planned surgery and emergency surgery that cannot be postponed[5,7,9].

In addition to preparing a specific protocol for the management of these patients, we developed a nose mask as a protective tool, in collaboration with the engineering team at the Instituto de Investigación Marqués de Valdecilla (IDIVAL) [Marqués de Valdecilla Research Institute] and the Hospital Virtual de Valdecilla [Valdecilla Virtual Hospital] (Fig. 1). This mask adapts perfectly to the shape of the patient's nose, allowing surgical instruments to pass through an anterior opening, closed by a separate flexible valve. It also has a small outlet port on its upper edge that enables sustained suction. This creates a safe pathway with constant negative pressure that protects against potentially contaminated droplets and aerosols produced during these procedures. This recently published design has been experimentally demonstrated to be useful in decreasing aerosol generation[10]. This product is currently in the process of being placed on the market to facilitate its use and distribution. However, if any centre is interested in using it, we will share the design plans to enable 3D printing.

Planned surgery: double screening

The choice of surgical technique is based on double screening with the aim of decreasing the possibility of false negatives. The percentage of false negative results of reverse transcription-polymerase chain reaction (RT-PCR) tests appears to range from 8% to 24%[1], and the estimated probability of patients testing negative twice and carrying the virus in the nasopharyngeal mucosa is 0.64%–5.76%.

Moreover, venous serology identifies patients who have been immunised and theoretically lack the ability to spread the virus in a surgical procedure of this nature. Nevertheless, as there have been isolated case reports of spread despite immunisation, we will always have all patients undergo polymerase chain reaction (PCR) testing[11].

Finally, double clinical screening makes it possible to detect the onset of symptoms during the window between the two PCR tests. The risk of a false negative in patients with double negative clinical screening, negative serology and double negative PCR should be considered marginal, such that an endoscopic endonasal surgical procedure may be performed with adequate safety guarantees for patients and surgical area staff. In the event of a positive clinical screening, the subject shall be referred to an infectious disease clinic and, if possible, the surgery will be postponed.

In any case, to decrease potential risks, endoscopic endonasal surgery in non-immunised patients will be performed with special protective measures, including: use of the newly designed protection/aspiration device (Maskpirator); reduced number of surgical staff; use of face shields and FFP2 masks by scrub nurses, anaesthetists and surgeons; and

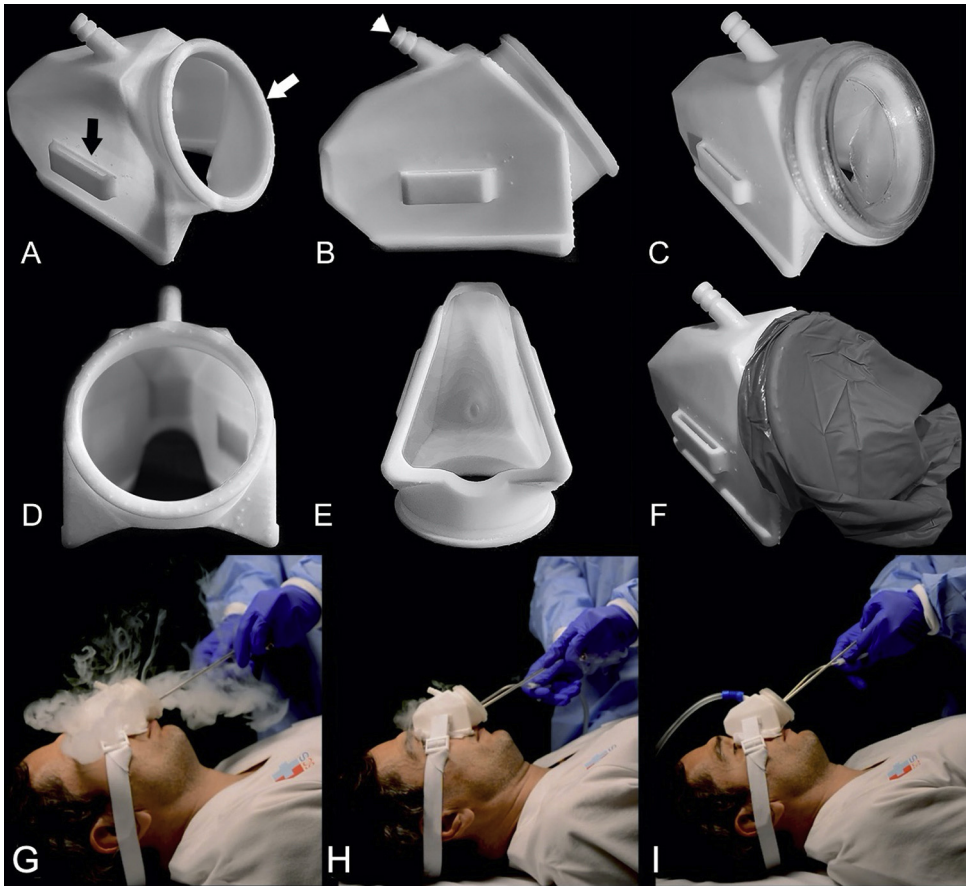

Fig. 1 – (A–F) Final Maskpirator prototype. The working port (white arrow) is on the front, the suction port is at the top (arrow tip) and the ear loops are on both sides (black arrow). A) General view. B) Side view. C) Maskpirator with a cover featuring a valve. D) Front view. E) Bottom view. F) Maskpirator with a glove cover. (G–I) Experiment performed following exhalation of steam in 3 situations: G) With the Maskpirator and working instruments inserted through the flexible valve. H) With the manual suction pump on. I) With additional Maskpirator suction, which visually eliminates the exhaled steam.

monopolar coagulation and high-speed motors used during the procedure only when strictly necessary, favouring the use of non-electric cutting instruments (Kerrison rongeurs) and other osteotomes[9,12–14]. Microdebriders are considered lower risk than drills when suction is included, but it is also recommended that their use be avoided as much as possible[13].

Emergency surgery that cannot be postponed: consider craniotomy

This is reserved solely for cases of rapidly progressive decline or pituitary apoplexy, in which medical management is not a viable option.

As in any other case of emergency surgery, a rapid RT-PCR test will be done and, once the result of this test is known, action will be taken accordingly. In cases in which the PCR test is negative, it is reasonable to proceed with the surgical treatment *via* an endoscopic endonasal approach, since the risk-benefit ratio is favourable in this situation.

In cases in which the patient tests positive for SARS-CoV-2 or is diagnosed with COVID-19, given the high viral load in the nasal fossae and the respiratory tract, craniotomy is a reasonable alternative and it is the preferred approach under these circumstances. The procedure is identical to that normally performed in any craniotomy in a COVID-19 patient: face shields and FFP2 masks are used by scrub nurses, anaesthetists and surgeons, and the use of monopolar coagulation, bipolar coagulation and high-speed motors is restricted.

Endoscopic endonasal surgery is reserved for cases in which craniotomy represents an increased risk that cannot be assumed by the patient. In this situation, additional safety measures will be taken for managing a surgical area with a high viral load:

- Full protection for the entire surgical team: FFP3 masks plus goggles and a face shield or air purifier masks, gowns and double waterproof gloves.
- Operating theatre with negative pressure.
- The number of staff following patient intubation should be kept to a minimum: a neurosurgeon, an otorhinolaryngologist, an anaesthetist, a scrub nurse and a circulating nurse, with no staff in training present.
- High-speed drilling should only be used when strictly necessary, favouring the use of Kerrison rongeurs or other osteotomes wherever possible.

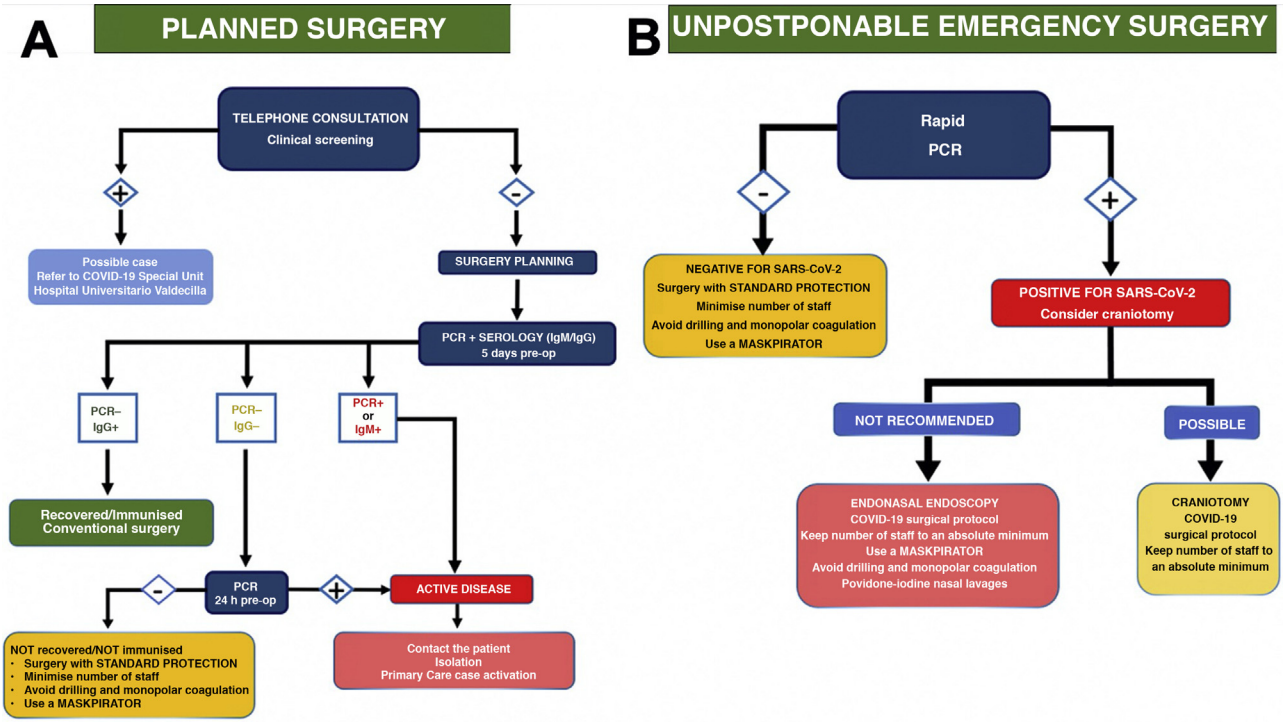

Fig. 2 – Flow charts of procedures followed in cases of planned surgery (A) and emergency surgery (B), respectively.

- Avoid the use of a microdebrider, unless it is essential. If it must be used, its rotation speed is to be decreased to 3000 rpm.
- Avoid the use of monopolar and bipolar scalpels. If their use cannot be avoided, take extreme precautions by increasing the aspiration of smoke.
- Use a Maskpirator throughout surgery.
- Nasal lavages with povidone-iodine in the patient. This measure adopted by some authors is based on the *in vitro* virucidal activity against SARS-CoV and MERS-CoV demonstrated by povidone-iodine solutions[15].

Flow charts for planned surgery and emergency surgery that cannot be postponed are shown in Fig. 2.

Perioperative and postoperative measures

In all cases, the number of in-person visits during the postoperative period will be kept to a minimum, so leaving a nasal pack or other materials, such as a silicone sheets (Silastic®), should be avoided. In addition, all examinations of the nasal area shall be performed while wearing a Maskpirator for protection.

Patients testing positive for SARS-CoV-2 will undergo fewer nasal lavages with normal saline, and wherever possible their check-ups will be postponed until they get a negative PCR test result and no longer need to isolate.

Conclusions

The COVID-19 pandemic currently represents a significant challenge for all medical-surgical activity around the world. In neurosurgery, endoscopic endonasal approaches carry an elevated risk for the healthcare staff who perform them, which means strategies need to be proposed so that they may be performed safely. To this end, a consensus protocol for the management of these patients was prepared, and a safety tool – the Maskpirator – was developed.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi: https://doi.org/10.1016/j.neucir.2021.03.007.

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