



My Thoughts/My Surgical Practice

Surgical strategies during the COVID-19 crisis: The Salzburg concept



COVID-19, caused by a novel corona virus termed SARS-CoV-2, originated in Wuhan/China in December 2019.<sup>1</sup> Subsequently COVID-19 spread over the whole world and had been labelled a pandemic by the WHO on March 11, 2020.<sup>2</sup>

With the increase of proven SARS-CoV-2 infections, an increase of surgical cases in this patient collective had to be anticipated as well. The two major strategies to fight the virus – in public as well as in hospitals – were ‘exposition prophylaxis’ and ‘quarantine measures’. Therefore, with arrival of COVID-19 in Salzburg/Austria in mid March 2020, we established a specialized “COVID Surgery Service (CSS)”, exclusively dealing with the COVID patients, and a “split team structure” (2 teams of specialists with complementing expertise) for the Non-COVID cases. This structure was designed under the assumption that alternating teams would remain capable of handling in case of necessary temporary quarantine of one team.

The CSS comprised of 6 attending surgeons (17% of the staff of

the department of surgery) and was part of a newly established COVID-clinic, encompassing a triage unit, emergency department, an outpatient department with 220 beds with separated wards for suspected and proven COVID cases, 3 intensive care units (with 81 beds for mechanical ventilation and 5 ECMO machines), one endoscopy unit and 3 operation theatres. An exclusive mobile CT-scanner unit was assembled close to the COVID-clinic to avoid contamination and blocking of the devices of the Non-COVID sector.

Availability of CT is regarded crucial for thoracic imaging in patients suspected of COVID-19 disease.<sup>3</sup> Furthermore, our CSS benefitted as well, because CT was available for patients with unclear abdomen.

Suggestions regarding personal protective equipment (PPE) during surgical operations and endoscopy procedures are rapidly emerging, but there are no unequivocally accepted standards as yet. Surgeries and endoscopies are regarded as “aerosol generating

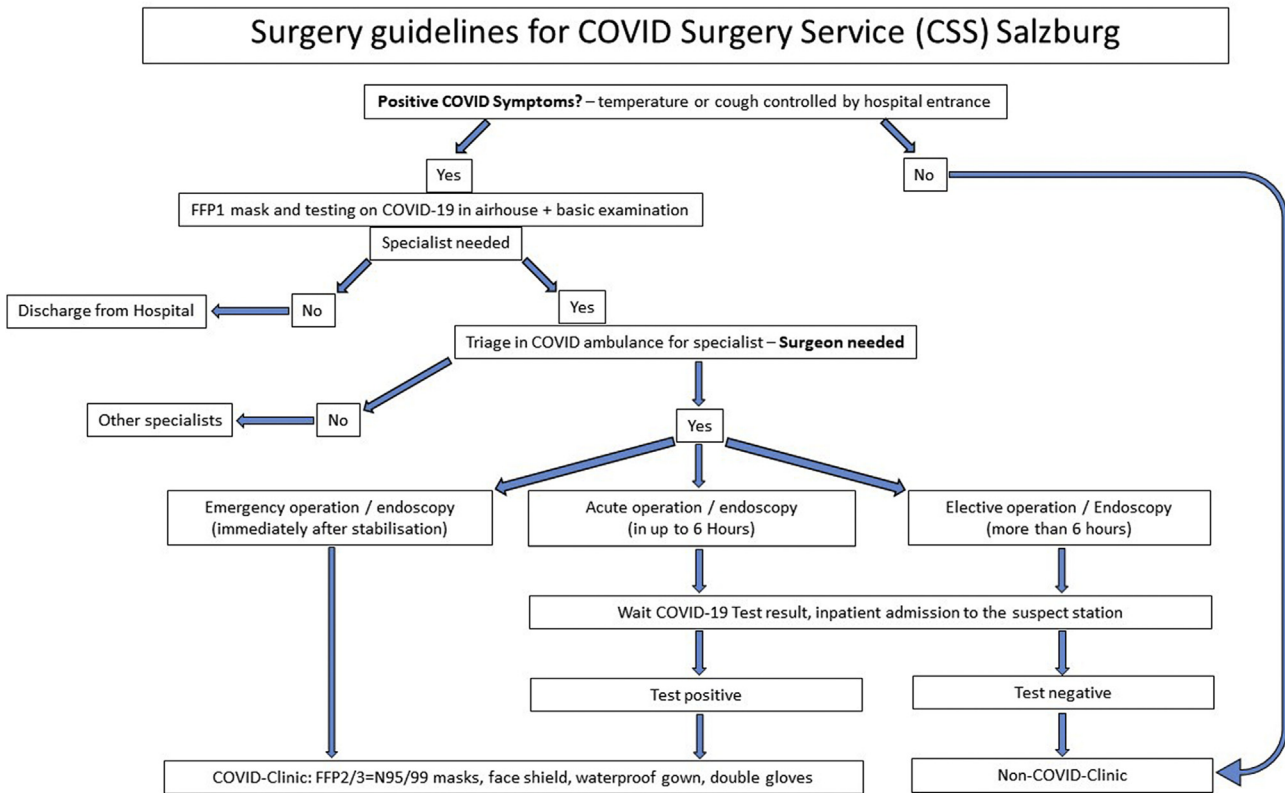


Fig. 1. Triage guidelines COVID surgery service (CSS).

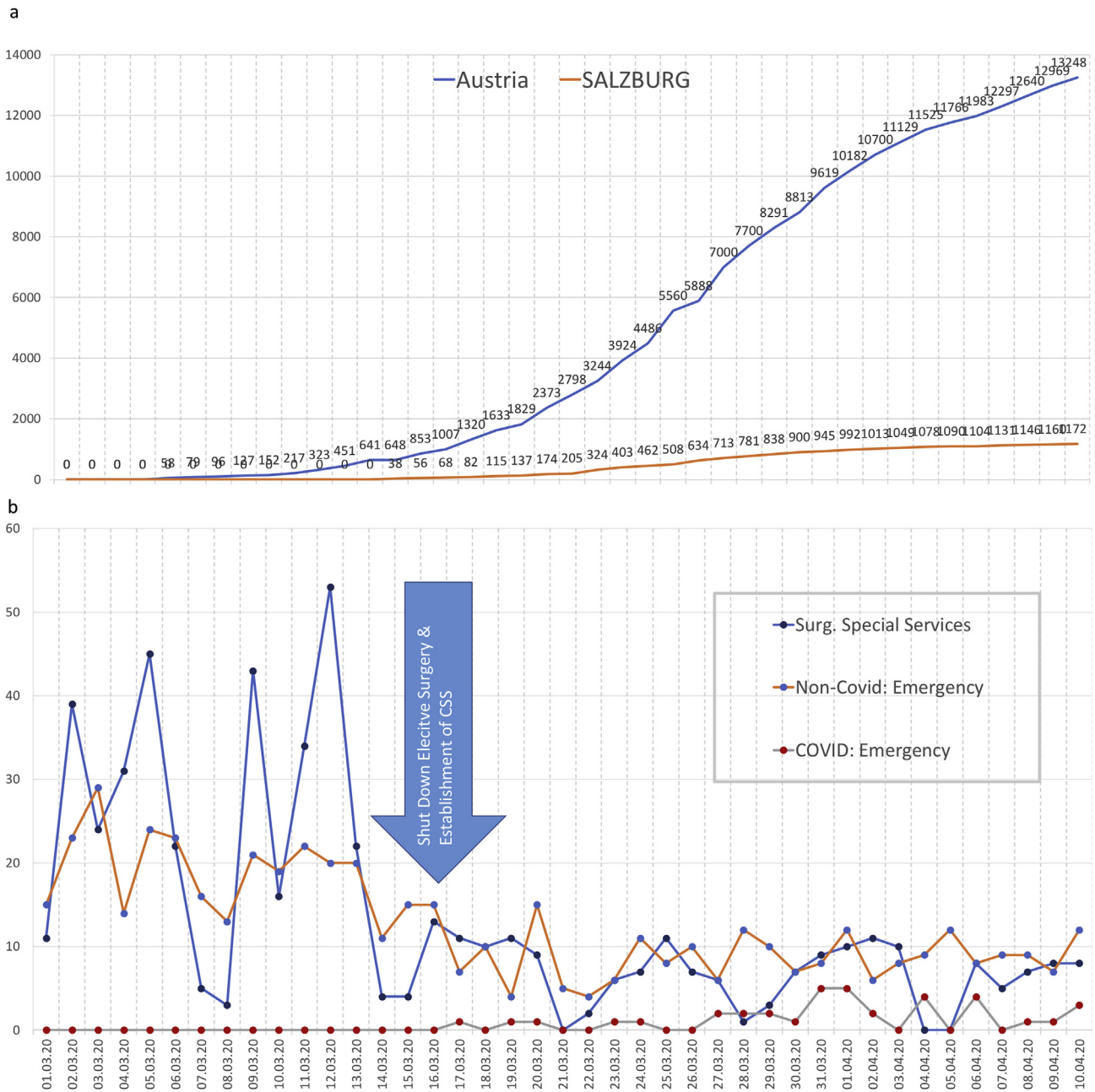


Fig. 2. a. Development of SARS-CoV2 positive patients in Austria and Salzburg. b. Development of case load surgical services.

procedures” (AGPs) with an increased risk of infection for involved medical staff.<sup>2,4,5</sup> Therefore, in Salzburg, a maximum of PPE was claimed necessary. We use a face shield, a European Union (EU) standard FFP2/3 mask (equivalent to a N95/99-certified mask of the National Institute for Occupational Safety and Health- NOISH in the U.S.), a waterproof gown, double gloves and desinfectable rubber shoes, which are changed after each single procedure and are standard in the OR setting hereabout anyway.

The emergency surgeries and endoscopies are performed upon our exclusive triage system demonstrated in Fig. 1. If there is a possibility to postpone surgery, it is suggested to wait for the result of COVID testing. With a negative test result, the patient is transferred to the Non-COVID service, with a positive test, the surgery takes place in the COVID clinic under the above-mentioned conditions.

The decision regarding the type of surgery (open vs minimally

invasive surgery) in the COVID-clinic is based on the same internationally accepted standards as in the Non-COVID-setting. All facilities for performing minimally-invasive surgeries are made available at our COVID-clinic. It is unclear if a laparoscopic procedure increases the risk for infection with the SARS-CoV-2 virus. Accumulation of smoke within the pneumoperitoneum may occur during monopolar dissection. This accumulated smoke may be expelled during the deflation of the pneumoperitoneum for any reason or in case of “trocar leakage”. For this reason, a filtration system (active or passive) (e.g. AirSeal® CO2 pressure insufflator (Surgiquest Inc., Milford, USA)) with filters (HEPA or ULPA) is included to the standard OR equipment.<sup>6</sup> This allows safe evacuation of the pneumoperitoneum when the minimally-invasive procedure is terminated. For open surgery an automatic smoke evacuator is established as standard device for monopolar

electrosurgery and the utilization of an ultrasonic dissector was discouraged, due to published concerns about its use.<sup>7,8</sup>

The COVID-Clinic and the COVID Surgery Service was started on March 16th, 2020, when Salzburg had 68 confirmed COVID-19 cases. Simultaneously, all elective surgeries (except for oncologic cases which are discussed on daily basis according to the availability of ICU beds) and other non-essential medical and surgical procedures were cancelled or delayed, following the “shut-down” prescribed by the authorities, which were concerned about the resources of that important PPE.<sup>9</sup> Fig. 2a + b illustrates the increasing number of patients in the county of Salzburg and in whole Austria (Fig. 2a) in parallel with the decrease of case load in the surgical Non-COVID outpatient department (OPD) (Fig. 2b). The “shut down” was followed by a slight increase of surgical cases seen in the COVID-Clinic. However, the number of surgical cases was not very high at the moment but tended to increase.

In conclusion, the Salzburg concept for management of COVID-19 is successful regarding the strict separation of COVID and Non-COVID patients, and the COVID Surgery Service can act in an entirely independent fashion.

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### Declaration of competing interest

None of the authors has a conflict of interest.

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### References

1. Zhu N, Zhang D, Wang W, et al. China novel coronavirus investigating and research team. *N Engl J Med*. 2020;382:727–733.
2. Al-Balas M, Al-Balas H, Al-Balas H. Surgery during the COVID-19 pandemic: A comprehensive overview and perioperative care. *Am J Surg*. 18 April 2020. <https://doi.org/10.1016/j.amjsurg.2020.04.018>. In press.
3. Chua F, Armstrong-James D, Desai SR, et al. The role of CT in case ascertainment and management of COVID-19 pneumonia in the UK: insights from high-incidence regions. *Lancet Respir Med*. 2020 May;8(5):438–440. [https://doi.org/10.1016/S2213-2600\(20\)30132-6](https://doi.org/10.1016/S2213-2600(20)30132-6). Epub 2020 Mar 25.
4. Brat GA, Hersey S, Chhabra K, Gupta A, Scott J. Protecting surgical teams during the COVID-19 outbreak: A narrative review and clinical considerations. *Ann Surg*. 2020 Apr;17. <https://doi.org/10.1097/SLA.0000000000003926>.
5. Nhs/Uk Government. COVID-19 personal protective equipment (PPE). <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/covid-19-personal-protective-equipment-ppe>. Accessed 10 April 2020.
6. Sages. Resources for smoke&gas evacuation during open, laparoscopic, and endoscopic procedures. In: <https://www.sages.org/resources-smoke-gas-evacuation-during-open-laparoscopic-endoscopic-procedures>. Accessed 10 April 2020.
7. Fencl J. Guideline implementation: surgical smoke safety. *ARON J*. 2017;105:488–497.
8. Zheng MH, Boni L, Fingerhut A. Minimally invasive surgery and the novel coronavirus outbreak: lessons learned in China and Italy. *Ann Surg*. 2020 Mar 26. <https://doi.org/10.1097/SLA.0000000000003924> [Epub ahead of print].
9. Diaz A, Sarac B, Schoenbrunner J, et al. Elective surgery in the time of COVID-19. *Am J Surg*. 16 April 2020. <https://doi.org/10.1016/j.amjsurg.2020.04.014>. In press.

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