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Impact of COVID-19 epidemic on maxillofacial surgery in Italy

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Abstract

Maxillofacial departments in 23 surgical units in Italy have been increasingly involved in facing the COVID-19 emergency. Elective surgeries have been progressively postponed to free up beds and offer human and material resources to those infected. We compiled an inventory of 32 questions to evaluate the impact of the SARS-COV2 epidemic on maxillofacial surgery in 23 selected Italian maxillofacial departments. The questionnaire focused on three different aspects: the variation of the workload, showing both a reduction of the number of team members

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(-16% among specialists, -11% among residents) due to reallocation or contamination and a consistent reduction of elective activities (the number of outpatient visits cancelled during the first month of the COVID-19 epidemic was about 10 000 all over Italy), while only tumour surgery and trauma surgery has been widely guaranteed; the screening procedures on patients and physicians (22% of maxillofacial units found infected surgeons, which is 4% of all maxillofacial surgeons); and the availability of Personal Protective Equipment, is only considered to be partial in 48% of Maxillofacial departments. This emergency has forced those of us in the Italian health system to change the way we work, but only time will prove if these changes have been effective.

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Introduction

The alleged first case of COVID-19 in Italy was diagnosed on 20 February 2020 in the town of Codogno, Lombardy.

Despite the attempt to limit the outbreak to the defined “red zone”, by quarantining all citizens and denying entry or departure from the area, similar cases were diagnosed in other cities without evident epidemiological correlation, starting the day after the first identification.

During the last week of February, the prevalence of Covid-19 started to rise not only in Italy but, with a delayed but similarly increasing trend, also in the rest of Europe. As we are writing, the cumulative incidence is of more than 80 000 cases of COVID19 in Italy. Nevertheless, because of a series of unclear factors, northern Italy (in particular Lombardy, Veneto, and the Emilia Romagna regions) suffered a heavier healthcare and, tragically, death burden.

Although general practitioners, emergency departments, infectious diseases units, respiratory disease units, and intensive care units (ICUs) were and still are standing in the front line of the action, every department of every hospital all over Italy was increasingly involved in facing this unique and unprecedented health emergency.¹ Since maxillofacial surgery departments are not standing in the front line of this struggle, elective surgeries have been postponed to free up beds and offer human and material resources and day-to-day care has been revolutionised in order to respond to the rapidly evolving health emergency.²

This article, involving 23 maxillofacial surgery departments from northern to southern Italy, focuses on the first four weeks of this pandemic, aiming to describe both the features of and obstacles to their involvement.

Material and methods

We compiled an inventory of 32 questions to evaluate the impact of SARS-COV2 epidemic on maxillofacial surgery in 23 selected Italian maxillofacial departments, which were chosen to represent the present situation across the country, with an emphasis on the role of teaching departments whenever possible. Each department designated a special-

ist from the staff to answer the questionnaire. Answers were subsequently collected anonymously, keeping track of the location of the department in order to geographically correlate answers.

The questionnaire (see Supplemental Material) was built around three major aspects:

- "02" Changes in the workload in terms of outpatient clinic, day-surgery and general anaesthesia surgery;
- "02" Screening COVID-19 procedures used for patients and/or healthcare workers;
- "02" Workforce and patient protection methods to avoid SARS-COV2 spreading during daily activities.

Moreover, personal protective equipment (PPE) supply was considered to be a relevant topic in our field, due to the high frequency of oral and nasal cavity explorations.

Quantitative and qualitative data were recorded and statistically analysed using Excel software 15.0 (Microsoft Corp). Our analysis divided Italian maxillofacial units into 3 areas: high SARS-COV2 diffusion area (“red zone” including Lombardy, Emilia-Romagna and Veneto regions), intermediate SARS-COV2 diffusion area (“yellow zone” including Piedmont and Liguria regions) and low SARS-COV2 diffusion area (“green zone” including the remaining Italian regions).

Results

We observed a reduction in the number of team members for all the considered zones, mostly among maxillofacial specialists (16% reduction vs. 11% reduction for residents) [Table 1].

Some maxillofacial surgeons, mostly in the red and yellow areas, had positive SARS-COV2 nasopharyngeal swabs (4% of all maxillofacial specialists and residents in 22% of all maxillofacial departments assessed) and were isolated for 14 days in the so-called “standard quarantine”, waiting for symptoms’ remission or negative test results in order to return to work [Table 2].

Among the causes of staff reduction there was also the full-time or part-time re-allocation of maxillofacial surgeons, both specialists and residents (17% of team members). The

Table 1
Maxillofacial surgeons number variation during COVID-19 epidemic. Data are mean (SD)

	Number of specialists			Number of residents		
	Pre-epidemic	In-epidemic	Variation rate	Pre-epidemic	In-epidemic	Variation rate
Red zone	7.2 (1.99)	5.90 (2,33)	-18%	4.5 (2.91)	4.2 (2.93)	-6%
Yellow zone	8.50 (0.71)	4.50 (6,36)	-47%	7.00 (9.89)	7.00 (9.89)	0%
Green zone	7.27 (2.20)	6.73 (2,41)	-6%	4.18 (6.06)	3.36 (5.50)	-20%
23 Maxillofacial Units	7.35 (1,99)	6,17 (2,67)	-16%	4,56 (5,02)	4,04 (4,77)	-11%

Table 2
Positive doctors' percentage and their management.

	Positive doctors					
	Yes, there are positive doctors in my department			No, there are not positive doctors in my department		I don't know if there are positive doctors in my department
	Standard quarantine	Prolonged quarantine	Come back to work			
Red zone	3%	0%	0%	36%		4%
Yellow zone	0.5%	0%	0%	11%		0%
Green zone	0.5%	0%	0%	40%		5%
23 Maxillofacial Units	4%	0%	0%	87%		9%

Table 3
Maxillofacial surgeon re-allocation during COVID-19 epidemic.

	Re-allocated doctors	Wards for re-allocation							
		COVID internal medicine	NON-COVID internal medicine	Infectious disease	Respiratory disease	ER	ICU	Service medicine	Other
Red zone	3.60 out of 117	44%	0%	6%	6%	6%	0%	6%	0%
Yellow zone	0 out of 31	0%	0%	0%	0%	0%	0%	0%	0%
Green zone	1.00 out of 126	6%	0%	0%	0%	13%	0%	6%	6%
23 Maxillofacial Units	2.04 out of 274	50%	0%	6%	6%	19%	0%	13%	6%

majority went to COVID internal medicine units (50% of the reallocated resources), while 19% of physicians were included in emergency departments, 13% in the service medicine units, 6% in the infectious disease units and 6% in the respiratory disease units. The re-allocation process of maxillofacial surgeons took part mostly in red and yellow zones [Table 3].

Questionnaire results show an important decrease in every maxillofacial activity, with no substantial difference among the three identified zones. Outpatient visits showed an 87% decrease, while outpatient surgery (i.e. day surgery) decreased by 86% [Table 4]. The maintained activity includes biopsy and skin cancer surgery in all the departments.

Inpatient general anaesthesia surgery reduced as well, (78% countrywide reduction. Despite COVID-19 epidemic, most maxillofacial surgery units have carried on the surgical management of facial trauma - although with a much reduced incidence (74%) and head and neck oncology (90%), considered time-dependent diseases. On the other hand, only few departments have maintained other kind of surgery, such as craniofacial (9%), microsurgery (17%) and paediatric surgery (4%).

The number of visits performed weekly among the 23 maxillofacial surgical units over Italy in the pre-epidemic

period was about 2518. Therefore, during the first Covid-19 epidemic month, the missed maxillofacial visits were about 10 000. Similar considerations could be referred to outpatient surgery, with the unavoidable delay of over 1 700 procedures, as well as 800 missed inpatient maxillofacial surgeries during March 2020 over the 23 departments.

Speaking about private practice, only 9% of maxillofacial units maintained their current activity, mainly about undelayable procedures such as oncological evaluations and surgery.

A total of 61% of maxillofacial surgery have been merged with other units, while 17% remained open with a reduced number of beds. A total of 9% of maxillofacial wards, mainly in the red zone, have been converted into COVID-19 units.

A total of 43% of questionnaires (10 out of 23) reported that regional healthcare systems identified a number of COVID-19-free hospitals (hubs) to warrant contamination-free essential surgical procedures. The designated hub hospitals dealt with pathologies that could not be postponed: 50% of hub hospitals dealt with major traumas, 50% dealt with COVID-free traumas, 40% with COVID traumas, while major head and neck oncology with postoperative ICU admission was performed in 70% of hub hospitals and COVID-free head and neck oncology in 50% of hub hospitals. Only three

Table 4
Visits and Surgery variation during COVID-19 epidemic. Data are mean (SD)

	Outpatient visits per week			Outpatient surgery per week			Inpatient surgery per week		
	Pre-epidemic	In-epidemic	Variation rate	Pre-epidemic	In-epidemic	Variation rate	Pre-epidemic	In-epidemic	Variation rate
Red zone	140.5 (68.97)	1.,5 (±12,92)	-87%	25.1 (21,06)	4.1 (7,21)	-84%	11.66 (3,06)	2.55 (0,97)	-78%
Yellow zone	110.00 (14.14)	12.5 (±17,67)	-89%	22.50 (10,61)	2.00 (2,82)	-91%	8.50 (0,71)	2.01 (2,82)	-76%
Green zone	114.36 (82.98)	14.09 (±8,17)	-88%	19.72 (14,19)	2.27 (1,84)	-88%	12.54 (8,74)	2.81 (1,60)	-78%
23 Maxillofacial Units	125.34 (72,60)	15,86 (10,89)	-87%	22,30 (16,88)	3,04 (4,91)	-86%	11,81 (6,31)	2,63 (1,40)	-78%

Table 5
Screening procedures on patients during COVID-19 epidemic.

	Nasopharyngeal swab					
	Yes, for everyone	Yes, hospitalised patients	Yes, patients undergoing surgery	Yes, patients with comorbidity	Yes, symptomatic patients	No
Red zone	0%	9%	9%	0%	9%	17%
Yellow zone	0%	0%	0%	0%	9%	0%
Green zone	0%	9%	0%	0%	25%	13%
23 Maxillofacial Units	0%	18%	9%	0%	43%	30%

Table 6
Positive patients' percentage and their management.

	Positive patients		
	yes		no
	isolated	transferred	
Red zone	0%	26%	17%
Yellow zone	0%	9%	0%
Green zone	0%	9%	39%
Italy	0%	44%	56%

structures have been chosen as hub structures for paediatric surgery (20%) and neurosurgery (10%), respectively.

Nasopharyngeal swabs were performed mostly in symptomatic patients (43%), followed by already hospitalised patients (18%) and candidates for surgery (9%). This last rate is low due to the recent introduction of such preoperative screenings in most centres. 43% of patients screened positive for SARS-COV2 infection. These patients were transferred in Covid-19 departments for evaluation and treatment [Table 5 and 6].

Speaking about PPE, FFP2/N95 masks were provided in 61% of maxillofacial departments, mainly in the “red zone” (80%); a similar but reduced distribution was observed considering FFP3/N99 masks, provided only in 26% of maxillofacial units (40% red zones unit).

Disposable gloves and surgical masks were provided in 91% and in 100% of maxillofacial wards, respectively, while disposable gowns were supplied only in 39% of maxillofacial units. PPE supply is considered to have been partial in 48% of maxillofacial departments, mainly in red (60%) and yellow (100%) areas, while 48% of the remaining ones considered the supply adequate for the requests, mostly in the green zone (73%).

Several methods have been applied to reduce SARS-COV2 diffusion. During visits the most used methods were limitation of social physical interaction (91%), health workers wearing PPE (83%) and waiting room redesign (83%), followed by using risk factor surveys (39%), telephone symptoms' evaluation (35%) and patients PPE given out by the hospital (35%).

During inpatient activity, similar methods are adopted. The most used were again limitation of physical interaction (91%), limitation of relatives' visits (96%), health workers wearing PPE (83%) and body temperature control of both patients (61%) and health workers (48%). We assessed fewer screening procedures such as nasopharyngeal swabs (26%), telephone evaluations of COVID-19 symptoms (43%) and risk factor surveys (52%).

Discussion

Since the COVID-19 epidemic started, maxillofacial elective surgery was gradually reduced nationwide and clinical work scaled down in order to keep services running without putting both the healthcare workers and patients at risk.

A common trend emerged in keeping services running, while progressively reducing the outpatient access to those solicited by primary care physicians and other specialists. For outpatient visits, this kind of selection could be performed by the identification of prescriptions marked as urgent or non-urgent.

For what concerns outpatient and inpatient surgery, on a clinical and management level, maxillofacial surgeons have to make important choices to identify cases that would necessarily need surgical treatment even in health emergency situations. These choices are intended to guarantee the ideal timing to perform surgery for time-dependent

pathologies such as head and neck cancers and facial trauma. Due to the emergent situation, guidelines for Italian maxillofacial surgeons were not available, and other societies' recent suggestions are not founded on evidence-based medicine.^{3,4}

Treatment of cleft lip and palate deformities were not delayed over 9 months of age to avoid subsequent impairment of speech. Also, patients with facial paralysis have been added to the list of urgent surgeries if the onset of paralysis was close to 18 months in order to avoid losing the chance to reanimate mimetic musculature.⁵

Even if some regional specific hubs have been identified to collect all patients affected by a specific pathology in a COVID-19-free location, allowing them to not suspend all the elective surgery, the questionnaire focuses the attention on the missed visits and surgical procedures since the COVID-19 epidemic started. The huge reduction of outpatient visits (-87%) and outpatient (-86%) and inpatient surgical procedures (-78%) that the questionnaire shows four weeks after the beginning of the pandemic suggests a longer and longer waiting lists for all non-urgent pathologies.

Four weeks after the pandemic started, at a time when nobody is able to say how long it will last, physicians are starting to wonder how the waiting list issue will be managed at the end of the course of this pandemic. This already evident, and more and more emerging, problem should be managed in order to guarantee an acceptable care level in terms of the correct timing of diagnosis and treatment.

Physicians can only assume that possible solutions to this issue include the permanent hiring of temporary workers and the purchase of the medical and surgical tools, to increase the workforce and consequently the provided services.

The questionnaire answers show how a pandemic affects private practice also. In order to protect both the healthcare workers and the patients, private practice has been interrupted almost everywhere. The exceptions are two wards in the "green zone" in which private practice is still possible for urgent cases.

The temporary interruption of the private practice and the elongation of the waiting might increase the use of private practice in the future. On the contrary, a possible economic crisis might reduce private practice.

While the COVID-19 emergency was becoming more and more diffused and routine maxillofacial surgery activity reducing, a varying number of maxillofacial staff needed to be reallocated.

Maxillofacial surgeons and residents have mostly joined COVID-19 internal medicine and emergency departments, and have provided temporary tracheostomies to patients and nasopharyngeal tests for health-workers and patients. Few resources were allocated for shifts in respiratory and infectious disease departments, due to the relevant skills required in these wards. Other activities involved maxillofacial residents in volunteering in full emergency medical services (999 equivalent).⁶

Eventually, personal safety in healthcare workers, both in maxillofacial surgery practice and in new COVID-19 departments, became a hot topic due to the high transmission rates of SARS-COV2. In fact, we frequently perform aerosol-generating procedures. This underlines the importance of wearing adequate personal protective equipment PPE during most of our shifts, balancing the lack of supplies in this current emergency. Also, it seems reasonable to avoid aerosol-generating procedures as much as possible.

However, the availability of PPE replacements can vary between hospitals in different areas of Italy, as well between different wards in the same hospital. According to Xu et al, the recommendation, in a COVID-19 endemic area, is that when dealing with patients with or without fever, practitioners should wear Level 2 protection gear (N95/FFP2 masks or superior, medical protective glasses, disposable gown, gloves, medical hat, and boot covers).⁷

Level 2 protection protocols should be followed even during our regular nose and throat visits. On the other hand, disposable surgical masks should be used by patients as well to reduce one-way diffusion.⁷⁻⁹

For presumed and confirmed COVID-19 patients, surgery might be performed with Level 3 protection (in addition to level 2 protection, medical comprehensive respirator, medical breathing mask or positive pressure headgear are required): this material has not been utilised by surgeons of this survey because it was not available. Several adjunctive second protection were taken in those cases: double protection for eyes and feet, double gloves, neck protection, and an impermeable gown.

Nevertheless, we had to face the lack of PPE and protocols during this first month of the COVID-19 spreading. Even our same old disposable surgical masks became a good staple in these days, while "true" PPE, such as FFP2/N95 masks started being disseminated only in the last week. Only 61% of maxillofacial departments has FFP2/N95 masks for surgical activities, mostly in red zone areas (80%). Disposable gowns and FFP3/N99 masks are provided less often, while disposable gloves, glasses, and surgical masks are adequately supplied.

Similar considerations could be extended to other behavioural methods used to limit SARS-COV2 diffusion both during inpatient and outpatient practice, and applied to healthcare workers and patients. Alongside personal protective equipment, the most required actions were the removal of unnecessary physical contacts, limited access to the hospital/department for relatives, and body temperature assessment before admission into the hospital for patients. On the contrary and unfortunately, nasopharyngeal test for SARS-COV2 infection and risk factor screening questionnaire were performed less often in different Italian hospitals.

Conclusion

Italian maxillofacial surgeons had an attitude of high collaboration with non-surgical colleagues and 22% of maxillofacial units found infected surgeons (4% of maxillofacial surgeons), of different grades according to the intensity of contamination of the geographic areas. All maxillofacial activity has been highly reduced during the first month of the COVID-19 epidemic: tumour surgery and trauma surgery has been widely guaranteed, while other pathologies are accumulating delays.

It might be interesting and useful to compare the Italian experience with other countries, which are at present at a different time point of the outbreak.

Conflict of interest

We have no conflicts of interest.

Ethics statement/confirmation of patients' permission

Not necessary.

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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.bjoms.2020.04.035>.

References

1. Grasselli G, Pesenti A, Cecconi M. Critical Care Utilization for the COVID-19 Outbreak in Lombardy, Italy: Early Experience and Forecast During an Emergency Response. *JAMA* 2020 [Epub ahead of print].
2. Saibene AM, Allevi F, Biglioli F, et al. Role and management of a head and neck department during the COVID-19 outbreak in Lombardy. *Otolaryngol Head Neck Surg* 2020 [Epub ahead of print].
3. <https://societabasicranio.it/blog/chirurgia-del-basicranio-durante-l-emergenza-covid-19.html> accessed on April the 17th 2020.
4. https://aocmf3.aofoundation.org/-/media/project/aocmf/aocmf/files/covid-19/ao_cmf_covid-19_task_force_guidelines.pdf?la=en&hash=C2B89E1E6E9AB72EBF386C747D3BC74CF1009C1E accessed on April the 17th 2020.
5. Biglioli F, Allevi F, Rabbiosi D, et al. Triple innervation for re-animation of recent facial paralysis. *J Craniomaxillofac Surg* 2018;**46**(5):851–7.
6. Wong J, Goh QY, Tan Z, et al. Preparing for a COVID-19 pandemic: a review of operating room outbreak response measures in a large tertiary hospital in Singapore. *Can J Anesth* 2020 [Epub ahead of print].
7. Xu K, Lai XQ, Liu Z. Suggestions for prevention of 2019 novel coronavirus infection in otolaryngology head and neck surgery medical staff. *Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi* 2020 [Epub ahead of print].
8. Adams JG, Walls RM. Supporting the Health Care Workforce During the COVID-19 Global Epidemic. *JAMA* 2020 [Epub ahead of print].
9. Tao KX, Zhang BX, Zhang P, et al. Recommendations for general surgery clinical practice in 2019 coronavirus disease situation. *Zhonghua Wai Ke Za Zhi* 2020;**58**(3):170–7.