Online version at http://www.minervamedica.it

Minerva Orthopedics 2021 October;72(5):520-5
DOI: 10.23736/S2784-8469.20.04075-8

ORIGINAL ARTICLE

New management and trauma incidence in hand surgery during the phase 1 of COVID-19 pandemic in a referral hand surgery and microsurgery center into the outbreak in North Italy

Andrea LETI ACCIARO [1] *, Sara MONTANARI [1], Marco VENTURELLI [1], Giorgio DE SANTIS [2], Marta STARNONI [2], Roberto ADANI [1]

[1]Department of Hand Surgery and Microsurgery, University Hospital of Modena, Modena, Italy; [2]Department of Plastic Surgery, University Hospital of Modena, Modena, Italy

*Corresponding author: Andrea Leti Acciaro, Department of Hand Surgery and Microsurgery, University Hospital of Modena, Largo del Pozzo 71, 41125 Modena, Italy. E-mail: andrealetiacciaro@libero.it

ABSTRACT

BACKGROUND: This is a retrospective study of the casuistry occurred at the Hand Surgery and Microsurgery HUB Center of Emilia-Romagna during the months of March and April 2020 in the peak of Phase 1 of COVID-19 pandemic in Italy, comparing the data with the same period in 2019.

METHODS: A more relevant reduction of 92.3% in elective surgery and a significantly less relevant reduction of 37.2% in emergencies was recorded. Replantation did not present reduction while cutting lesions of tendons and saw injuries increased such as the injuries during domestic activities.

RESULTS: The incidence of hand trauma looks not only at the traditional field of artisanal and industrial injuries, but also to the most recorded accidents in daily life activities. The data evidenced the significantly increase of the injuries occurring in the domestic environment. The 72.8% of emergencies was treated in day-service with significantly reduction in hospitalization, costs and infective risks. Telemedicine implementation has experienced to upgrade the relationship in the emergency network.

CONCLUSIONS: Hand injuries remained a major issue also during the lockdown. A functional and skill emergency service and day-service during the phase 1 COVID-19 pandemic played a relevant role in efficacy and efficiency. The utility of telemedicine was greatly limited by liability and risk management issues.

(*Cite this article as*: Leti Acciaro A, Montanari S, Venturelli M, De Santis G, Starnoni M, Adani R. New management and trauma incidence in hand surgery during the phase 1 of COVID-19 pandemic in a referral hand surgery and microsurgery center into the outbreak in North Italy. Minerva Orthop 2021;72:520-5. DOI: 10.23736/S2784-8469.20.04075-8)

KEY WORDS: COVID-19; Surgical procedures, operative; Emergencies; Coronavirus; Telemedicine.

The first hospitalized severe cases of COVID-19 in two different clusters in North Italy were confirmed by test result on 20 and 21of February, and in less than three days the coronavirus has spread quickly in all the neighboring regions. The first outbreak areas were isolated, and people are not allowed to enter or leave it, but the rapid spread and the dangerousness of the disease needed a complete lockdown in Italy imposed by the Health Minister and Governors on March 9.[1] According to the rigid measures of social containment, the emergence of COVID-19 pandemic has severely affected not only the medical treatment protocols but also the epidemiology and incidence of the trauma and diseases, because of the relevant modifications both

in working and daily activities, and in contagion of healthcare workers and patients. The national and local technical committees of specialists defined and constantly upgraded and disseminated specific protocols to ensure the safety of patients and healthcare staff.[2]

Most upper extremity injuries reported in literature occurs at home (45.4%), while 16.2% are work-related. Other common sites are school (6.6%), other public property (4.1%), and street (2.5%).[3, 4] However, a substantial number of locations were not recorded (25.1%). According to the Hub and Spoke in the Emergency/Urgency System, in Italy the microsurgery and surgery of the hand is organized in referral centers available 24 hours a day for three million people on average. Thus, meaning a referral center for each region in the North of Italy. The Hand Surgery and Microsurgery Complex Structure of Modena represents the HUB Center in Emilia-Romagna, operating more than 4000 cases/year.[3] Limitations for trauma direct transferring and consultations were imposed in order to minimize the risk of contagion. Telematic solutions allowed for a remote diagnosis and assisted treatment of patients through telecommunication technology.[5] Even if the use of digital technology in the Italian healthcare system has increased over the last years, telehealth services have not been established. Nevertheless, important limitations in telemedicine approach were found due to inexperience in this field. The Hub Center have identified the potentialities of telemedicine application in emergency network.

Materials and methods

The authors performed a retrospective study of the casuistry occurred at the Hand Surgery and Microsurgery HUB Center of Emilia-Romagna during the months of March and April 2020 in the peak of Phase 1 of COVID-19 pandemic in Italy, comparing the data with the casuistry of the same period in 2019.

All elective surgery was cancelled but the admission to the dedicated emergency room of the service and the treatment of emergencies were guaranteed for the entire period with drastic measures put in place by the infection control department for both patients and healthcare workers to limit contagion. Different management was defined for emergencies requiring immediate surgical treatment and hospitalization or emergencies requiring planned surgical treatment (urgencies) within few days in hospitalization or in day-service. In event of surgical treatment in local anesthesia in patient with a negative anamnesis and no symptoms, the patient was placed in the schedule in the day-service without serology and swab. If in day-services was necessary, an axillary block or maneuvers aerosol generating the patient was screened with serology and swab such as for patient needing hospitalization. In event of an emergency the serology and swab (response within three hours) were performed immediately before surgery, allowing the following hospitalization in COVID-19 area or COVID-19 free area.

According to the regional and inter-regional network of hand trauma emergency between Spokes and Hub centers the telemedicine was identified as an important help to evaluate the severity of the lesions. The visual information allowed the decision to keep or postpone the transferring or to perform the appropriate treatment in the spoke center, avoiding unnecessary transferring.

Results

The retrospective analysis of the two months period of March-April 2020 *vs.* 2019 (Table I) showed a general reduction in surgeries of 68.5% (171 *vs.* 543) with a more relevant reduction of 92.3% in elective surgery (24 *vs.* 309) and a significantly less relevant reduction of 37,2% in urgencies (147 *vs.* 234). Thus, meaning the 86% of surgical procedure performed were urgencies and the 72.8% of these were possible in the day-service. According to the typology of lesions the general reduction was not reported in the of cutting tendon injuries, increased of 24% (31 *vs.* 25), and in the unvaried replantation (4 *vs.* 4). However, the partial or total amputations decreased of 47.6%, but 80% of these were related to circular saw injuries mainly from the mountain districts.

On the same bases, the access to hand trauma emergency rooms decreased 60.1% (449 *vs.*

TABLE I.—*Highlights of the most significant data compared in the two months March-April 2019 and 2020.*

		2019	2020		Percentage of urgencies/total		Percentage of urgencies in day-service	
Elective	Hospitalized	168	18	-89.3%				
	Day-service	141	6	-95.75%				
	total	309	24	-92.3%				
Urgency	Hospitalized	100	40	-60%				
	Day-service	134	107	-30.15%			107/147	72.8%
	total	234	147	-37.2%	147/171	86%		
Total		543	171	-68.5%				
	Tendon lesions	25	31	+24%				
	Replantation	4	4	=				
	Partial or total amputations	21	10	-47.6%	Saw injuries	80%		
ER accesses		1126	447	-60.1%				
	Hospitalized Emergencies	32	12	-62.5%				
	Complex lesions not transferred	0	9	-				

1126) due to the emergencies requiring immediate hospitalization (12 *vs.* 32).

In addition, 2 non-avascular complex lesions were treated in the spoke centers of the high infected red areas recurring to Telematics interfaces and efforts between the surgeons of the Spoke and Hub, without transferring the patients, and almost 6 digital amputations without indications to replantation were telematically detected and managed in the Spokes. One patient with an avascular digital lesion eligible for transferring to the Hub refused it and was trimmed in the Spoke.

Discussion

The incidence and epidemiology of hand and upper limbs trauma looks not only at the traditional field of artisanal and industrial injuries, but also to the most relevant, and highlighted also by the WHO organization, accidents in the daily life activities.[3, 4] On this basis, it is not unexpected the data resulting from the comparison of the casuistry referring to the Hand Surgery and Microsurgery HUB Center of Emilia-Romagna between the two months of March and April 2019 *versus* 2020 in the phase 1 of COVID-19 pandemic in Italy. The significantly less reduction recorded in emergency surgery (-37.2%) respect the more relevant reduction in elective surgery (-92.3%) shows how the hand injuries remain a major issue also during the lockdown. Also, the extrapolation of specific data, according to the epidemiology, evidenced the significantly increase of the injuries occurring in domestic environment such as tendons cutting and saw lesion at the hand and fingers (+24%) or trauma during hobbies, fitness or playing activities at home, and children founded alternative and not usual places to play, with following unusual and infected wounds by stagnant water and reeds.[6, 7]

The lockdown reduced the trauma related to traffic, working accidents, artisanal, industrial and forest related trauma. The more relevant reduction of emergencies (-62.5%) and urgencies hospitalizations (-60%) and most surgical procedures in day-service (72.8%) were related to a less severity in injury due to the recurring of trauma in low threatening environments.

Despite the reduction of partial or complete amputations, the replantation did not have any reduction because of the transferring of patients from neighboring regions and the increase in circular saw injuries. The network of the microsurgical emergencies suffered the closure of the borders and the unavailable private hospital. Circular saw injuries occurred in 80% of the partial or complete amputations due to the increase of domestic hobbies and chopping wood from mountains.

According to the organizational model, the dedicated emergency room and day-service of the HUB Center permitted a prompt and excellent response to the COVID-19 emergency. A

Figure 1.—Emergency room and operative theatres of the hand surgery day-service.

dedicated day-service structure at the ground floor with easily and direct access and large spaces offered the possibility of a safe preadmission triage and social distancing in the waiting room. There were two emergency rooms for separated visiting and conservative treatment of the trauma. Three operative rooms with a preoperative anesthetist room and postoperative room (Figure 1). All these allowed the surgery in day-service in the 72.8% of the urgencies, both in local and wide-awake anesthesia or brachial plexus block. The use of a cartoon implemented the possibility of brachial plexus and local anesthesia also in children.[8] The protocol defined with the technical committee avoiding swab and serology in local anesthesia in patients without symptoms and suspected anamnesis allowed efficiency and reduction in time. Suspected or certain emergencies for COVID-19 were operated on in the ordinary operative room with high level of personal protective devices. A small percentage of elective surgery was mainly related only to oncologic patients and acute nerve compression.[9, 10]

According to the Hub and Spoke network the needing for learning and training of the surgeons in the spokes centers is mandatory such as the didactic efforts of the hub. Following the experience of more than ten years in offering an annual Master's degree in hand surgery and microsurgery, the Hub Center consolidated both an effective learning program and further close collaboration of the trained surgeons. On these bases the utilization of the most popular social platforms was spontaneously emphasized in personal working network.

The telemedicine may be used to facilitate the remote use of medical skills where the need arises and to optimize healthcare resources. For these reasons, it may be regulated by healthcare organizations for legal, ethical, medico-legal and risk management aspects.[11] According to the more relevant experience developed in telemedi-

cine during the COVID-19 crisis by the Clinic of Plastic surgery in our hospital, the priority in hand surgery was even more to determine the technology resources available in the regional networks. The hospitals within the same city district have dedicated software and hardware only in transmitting data according to radiological and hematologic examinations. On the other hand, there is not the possibility to use a common institutional teleconferencing software for audiovisual encounter which matched our needs between Spokes and Hub. Even in presence of guidelines[12] for an appropriate selection of patients requiring transferring which could be served *via* telemedicine, certification of platform security in terms of privacy and data transmission matters, high server capacity to support remote video, and devices with a microphone and a high-resolution camera are not available.

Conclusions

The hand injuries derive from a wide range of trauma from various environments of daily living, working and playing activities, and it is not surprising the central role for the hand surgery and microsurgery HUB center also during the lockdown. Despite the general reduction of activities, the emergency room and the operative rooms maintained their relevant efforts in emergency management. The average gravity of the admitted injuries was fortunately less severe than the work and traffic related ones. But not significantly less relevant in term of cases. A functional and skill organization resulted fundamental in the efficacy and efficiency of the patient management during the phase-1 COVID-19 emergency. The 86% of the surgical procedure were dedicated to urgency/emergency and the 72.8% of these were possible in the day-service, with prompt response and reduction of contagious risks. The role of telemedicine was fundamental to assess a close collaboration between the hub center and the spoke centers for the management of non-critical patients, but it involved different technical problems.[13-16] in terms of responsibility the telemedicine could constitute legally punishable behavior. Legal issues about medical liability for diagnostic and/or therapeutic errors can be related to data and privacy protection and informed consent for electronic health service with certified digital signature. Legal issues for malpractice and for technological malfunctions or poor quality should be taken into consideration. Specific insurance coverage should be reviewed, extending the insurance guarantee to these events as well. Furthermore, detailed traceability of telematic operators' activities might be a risk management task such as verifying accurate training of clinicians to limit possible medical errors and adverse events and ensure safe patient care. The COVID-19 experience highlighted not only the mandatory role of drastic protocol in admission and treatment of the patients, but also the relevant role of the organizational aspects of the surgical procedures and planning in hand trauma. On the other hand, the COVID-19 pandemic exacerbated all the critical points regarding a weak national Network of emergency system in microvascular lesions.

References

1. Indolfi C, Spaccarotella C. The outbreak of COVID-19 in Italy: fighting the pandemic. JACC Case Rep 2020;2:1414–8.

2. Starnoni M, Baccarani A, Pappalardo M, De Santis G. Management of personal protective equipment in Plastic surgery in the era of Coronavirus disease. Plast Reconstr Surg Glob Open 2020;8:e2879.

3. Battiston B, LetiAcciaro A, DeLeo A. The role of the FESSH Hand Trauma Committee in Europe. Handchir Mikrochir Plast Chir 2013;45:326–31.

4. Giustini M, de Leo A, Leti Acciaro A, Pajardi G, Mamo C, Voller F, *et al.* Incidence estimates of hand and upper extremity injuries in Italy. Ann Ist Super Sanita 2015;51:305–12.

5. Loeb AE, Rao SS, Ficke JR, Morris CD, Riley LH 3rd, Levin AS. Departmental Experience and Lessons Learned With Accelerated Introduction of Telemedicine During the COVID-19 Crisis. J Am Acad Orthop Surg 2020;28:e469–76.

6. Leti Acciaro A, Pilla F, Colzani G, Corradi N. A new sign allowing diagnosis in the pathologies of the extensor tendons of the hand. Injury 2018;49:1119–25.

7. Starnoni M, Colzani G, De Santis G, Leti Acciaro A. Management of locked volar radio-ulnar joint dislocation. Plast Reconstr Surg Glob Open 2019;7:e2480.

8. Leti Acciaro A, Pilla F, Faldini C, Adani R. The carpal tunnel syndrome in children. Musculoskelet Surg 2018;102:261–5.

9. Starnoni M, Colzani G, De Santis G, Acciaro AL. Median nerve injury caused by screw malpositioning in percutaneous scaphoid fracture fixation. Plast Reconstr Surg Glob Open 2019;7:e2292.

10. Baccarani A, Pappalardo M, Starnoni M, De Santis G. Plastic Surgeons in the Middle of the Coronavirus Disease 2019 Pandemic Storm in Italy. Plast Reconstr Surg Glob Open 2020;8:e2889.

11. Kim DW, Choi JY, Han KH. Risk management-based security evaluation model for telemedicine systems. BMC Med Inform Decis Mak 2020;20:106.

12. Landi A, Elliot D, Leti Acciaro A, Della Rosa N. Consensus issues on replantation within the upper limb. Fidenza: Ed. Mattioli; 2002.

13. Ray I, Poolsapassit N. Using attack trees to identify malicious attacks from authorized insiders. In: Vimercati SC, Syverson P, Gollmann D, editors. Computer security – ESORICS. Berlin: Springer; 2005

14. Camara C, Peris-Lopez P, Tapiador JE. Security and privacy issues in implantable medical devices: A comprehensive survey. J Biomed Inform 2015;55:272–89.

15. Al-Janabi S, Rawat S, Patel A, Al-Shourbaji I. Design and evaluation of a hybrid system for detection and prediction of faults in electrical transformers. Int J Electr Power Energy Syst 2015;67:324–35.

16. Mahdi MA, Al_Janabi S. A novel software to improve healthcare base on predictive analytics and mobile services for cloud data centers. In: Farhaoui Y, editor. Big data and networks technologies. Cham: Springer; 2020. p.320-39.

Conflicts of interest.—The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Authors' contributions.—Giorgio De Santis and Roberto Adani have given substantial contributions to manuscript design and project direction; Andrea Leti Acciaro and Marco Venturelli contributed to study conception and to the data collection and interpretation; Sara Montanari and Marta Starnoni contributed to the manuscript draft. All authors read and approved the final version of the manuscript.

History.—Manuscript accepted: November 5, 2020. - Manuscript received: October 27, 2020.