Clinical Analysis to the Cause of Hand Injuries and Its Countermeasures During the COVID-19 Outbreak and Work Resumption Period

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Research

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Abstract

Background: Under the new circumstance of COVID-19 pandemic, a full cognition of hand injury patterns may help with the injury prevention of the factories and management of medical institutions.

Methods: 38 patients were admitted to the orthopedics department with an emergent hand injury, were retrospectively collected from January 23th, 2020 to March 23,2020 . Information about demographics, type of injury, location of the injury, side of the lesion, mechanism of the injury, place where injuries occurred, surgical management and outcome was collected.

Results: The number of total emergency visits of hand injury during the outbreak of COVID-19 decreased 37% from the same period of last year, and during the work resumption it had achieved an increase of 25.7%. Most of the injured patients during the stage of COVID-19 outbreak were women (60%) with a mean age of 56.7, while in the stage of work resumption were men (82.1%) with a mean age of 47.4. Most of the injury occurred at work (60.7%), and machine injury was the most frequent injury mechanism (67.9%). Fingers were the most common injured part. The majority of the injuries were classified to be minor or moderate (90%) in the outbreak, and major (42.9%) in the work resumption.

Conclusion: We found an increased number of hand injuries, especially machine injury during the period of people returning to work after the outbreak of COVID-19. Medical institutions should be aware of the pattern of hand injuries during this special time in order to prepare services accordingly.

Level of evidence: Level IV.

Introduction

In early December 2019, a series of pneumonia cases caused by a novel coronavirus emerged in Wuhan, Hubei, China[1]. The coronavirus was first named 2019 novel coronavirus (2019-nCoV), widely known by the world. On 30 January, WHO declared it to be a public health emergency of international concern[2], and officially named it as Coronavirus Disease-2019 (COVID-19) on February 11, 2020. It has become a global disaster rapidly that affected hundreds of countries. As of May 27th, 2020, 5491678 confirmed cases and 349190 death cases have been documented in the whole world, collected in 217 counties[3]. China has effectively controlled the epidemic from spreading at the beginning of the outbreak and remains vigilant as the outbreak worsens globally. As of the same date, the pandemic has claimed the lives of 4645 people and infected 84547 on the Chinese mainland.

On Feb 19, the number of new infections dropped to three digits, and on March 6, to two digits-where it has remained, with most cases imported[4]. The city of Hangzhou has reported no new case of infection for 96 days, since February 20th. A four-tier public health emergency response system was generally used in China, with level I being the highest. On January 23th, government of Zhejiang province officially launched level I response. After strict prevention and control throughout the whole city, the response level was adjusted to level II on March 2nd, in the meeting of the standing committee of the provincial party

committee. And on March 23, it was adjusted to level III from level II[5]. Almost all businesses were shut down during the outbreak, except for the medical materials manufacturing enterprises. According to local authority, Enterprises that meet the "white list of enterprises" (i.e., those factories which are involved in the production of medical supplies, daily necessities, as well as the construction of key projects, important national economy or people's livelihood) in Hangzhou had resumed operations as of February 10th, with local employees back to work. As of February 20th, most of the factories had started returning to work[6]. During this special year, many domestic companies including GAC, BYD, SAIC-GM-Wuling and Changan, have transformed their businesses to provide medical supplies like facial masks for epidemic prevention and control[7, 8].

Under this new circumstance, a change in the pattern of hand injuries has attracted attention. We summarized the pattern and epidemiology of hand injuries during the COVID-19 outbreak and work resumption period as the pandemic subsides. The hypothesis is that hand injuries are more severe and industrial machine injuries are in the majority during work resumption. This study attempts to highlight the pattern of hand injuries after the outbreak of COVID-19, our management, and the outcome in our hospital. As time goes by, other countries outside China are also launching economic recovery programs to mitigate unemployment and stabilize core industries[9]. It is hoped that this study may provide guidance for the prevention and management of hand injuries in the work resumption of other regions.

Methods

This is a retrospective study of 38 cases in one designated hospital. The cases were all hand injuries registered and assessed in our hospital during the epidemic from January 23, 2020, when the coronavirus outbreak throughout country, to March 23, 2020, when the COVID-19 response was downgraded from level II to level III. Data were extracted and collected from the Emergency Department and Orthopedics Department database. A descriptive analysis was done. The collected data of interest included demographics (age and gender), profession, residence location, time and date of event and treatment. The following variables were further extracted from each hand injury case admitted to the hospital: type of injury, location of the injury, side of the lesion, mechanism of injury, place where injuries occurred, surgical management and outcome. The injuries were classified with the Modified Hand Injury Severity Score (MHISS).

Results

A total of 258 cases of hand injury emergency visits were recorded from January 23th, 2020 to March 23, 2020, including 46 cases during the outbreak from January 23th, 2020 to February 9th, 2020 and 212 cases during the resumption from February 10th, 2020 to March 23, 2020. The data of the same period in the last year was 73, 169, respectively. There were 37% fewer cases of emergency visits during the outbreak than the last year, and 25.4% more cases during the resumption than the last year. Of all

patients reviewed, 38 (14.7%) patients were admitted to hospital and treated in our department, including 10 (21.7%) during the outbreak phrase, and 28 (13.2%) during the resumption phrase.

Most of the patients in the outbreak phrase were middle-aged and elderly housewives. Injured patients had a mean age of 56.7 years (10.9). 4 cases (40%) during the outbreak were injured at home. The percentage of hand injuries at home was 26.3% more common than the last year during the outbreak (40% vs 16.7%). Knife lacerations were the most common injury. Finger injuries constituted around 9 (90%) of the total injuries. Due to the traffic controls, 8(80%) of the patients were nearby residents. Most of the injuries were mild to moderate (90%), except for one case of high-pressure disinfectant liquid injection injury of the finger (Fig. 1).

During the resumption from February 9th, 2020 to March 23, 2020, however, the percentage of hand injuries sustained at work was 22.3% more common than the last year (60.7% vs 37%), which was overwhelmingly middle-aged male. Injured patients had a mean age of 47.4 (11.9) years. Machine injuries make up the majority (67.9%). During this period, saw injury is a common occurrence admitted to our department. Many of these injuries results in muscle, tendon, nerve, and vascular damage. Palm, wrist and arm injuries constituted around 11% of the total injuries. In this period, hand injuries tend to be more severe and even disabling, which require emergency operations. The amputation rate in this phrase reached up to 14.3%, which was almost twice as much as that in the last year (7.4%). Fractures and dislocations were comparable to the last year (28.6% vs 29.6%). The mean range of stay was 20.3 days during the outbreak and 13.1 days during the resumption. The majority of the injuries were classified to be major (42.9%) in the work resumption. Table 1 shows the results of the patients during the outbreak of pandemic and the period of work resumption compared with the same period of last year.

There was one case of Crush injury while delivering medical supplies (Fig. 2), and another case of forearm injury caused by the cutting machine in a mask factory (Fig. 3). Special cases of hand injuries directly related to this pandemic were listed in Table 2. It mainly occurred in the production and delivery of the medical supplies.

Discussion

The COVID-19 has shattered the daily routine, business, schools, lifestyle and economy of the globe. Social distancing and self-quarantine aim to slow down the increase of new infections, thereby avoiding a surge in demand on health care systems[10]. Some measures such as telemedicine are recommended to reduce hospital visits for some mild injuries[11, 12]. But even at the time of social distancing, patients with severe injuries require urgent treatments. And the number of that had not decreased as supposed. Economic recovery has been accelerated all over the world after a long time of social distancing and economic stagnation. Workers have started to return to their work in succession. Our study is pioneering in describing the unique pattern of injuries during this special time. It highlights the “outbreaks” of injuries during the work resumption following the COVID-19 pandemic.

Trauma at home makes accounts for the majority of all hand injuries in the outbreak time. That was the inevitable result of people staying at home. Nonlocal patients visits were significantly reduced because of the traffic restriction. With the work resumption of industries, we've observed a distinct change in the pattern of hand injuries. High social demand after a long shutdown had driven the staff to throw themselves into high-intensity work. As a result, severe manufacturing traumas increased rapidly. As the result of pandemic and economic stagnation, the public have been experiencing psychological problems[13, 14]. It is supposed that anxiety, depression, and stress of workers may increase the risk of unintentional injuries during the resumption of work[15]. One type of hand injury was quite typical in this special year, that is, the medical supplies manufacturing industry which returned to work in the first place. Compared with the control group, the study group had a longer length of stay on average. This does not necessarily reflect worse injuries. It could be due to the situation that these injuries occur during this special season when the medical services slow down.

As for the factories, educational campaigns as well as increasing the availability of professional workers during this special time are needed to reduce the incidence of hand injuries. Especially for those companies that have newly transformed to provide medical supplies, lacking of experience was a common phenomenon. Work resumption is encouraged to proceed in batches and in order. Local workers without a history of exposure to epidemic areas were allowed to return work first[6].

Hospitals have to gear health care resources during this special time to meet the actual injury burden. As to reduce the risk of exposure in transit, patients were encouraged to treat in the hospital nearby. Furthermore, preventive efforts should be set in place to avoid the risk of COVID-19 spreading. Measures such as registration of personal information, regular disinfection, body temperature monitoring and cap on daily visitors are strictly implemented at all departments in our hospital to lower the risks of infection. Hangzhou was the first in the nation to launch a health QR code system on Feb 11, to curb the spread of infection as it tentatively restarted production[16]. The health QR code and body temperature is checked at the first stand of the hospital. Only patients with green QR code and normal body temperature are allowed into the emergency department. Those with temperatures higher than 37.3 are guided to the fever clinic first for the detection of infection. Nucleic acid test and CT lung screening are performed simultaneously. In our hospital, suspected patients are examined in a separated CT room different from the other patients. Statements with consensus agreement from an international Delphi process supported a distinction of surgery between protocols involving patients with suspected COVID-19 and those perceived to be free of infection[17]. Patients are admitted to the ward only when the pneumonia has been excluded by the sputum culture and CT. Preoperative preparation includes blood work, medical evaluation, chest x-ray and an EKG are performed while waiting for the COVID-19 test result. The initial clinician is responsible for the diagnosis and preliminary management of the injuries throughout the whole process. As direct contact is a high risk for healthcare professionals performing wound care, surgery and resuscitation[10, 18]. Appropriate use of personal protective equipment, as well as strict disinfection and hand hygiene are requested to every clinician[10, 19]. Under the premise of ensuring inspection, the time of emergency preoperative preparation was not significantly prolonged during the epidemic period. There are 105

patients of COVID-19 undergoing intense therapy and cured in our center. We have achieved amazing success with zero nosocomial infection and zero mortality rate in our center. None of the staffs in our center has been infected. Even in the solation wards, none of SARS-Cov-2 RNA was detected among the samples of objects[20].

In this special season, medical workers may become anxious and fear to continue their work. However, it's a time for solidarity, not fear. This outbreak is a test of solidarity political, financial and scientific, just as WHO Director-General Tedros Adhanom Ghebreyesus said[21]. Thus all doctors in our center have remained at their posts since the outbreak.

Conclusion

Work resumption of COVID-19 outbreak is risky time for hand injuries. The number of hand injuries, especially machine injury increased during the period of people returning to work after the outbreak of COVID-19. Emergency and surgical services should be aware of the pattern of hand injuries during this special time in order to prepare and plan services accordingly.

Declarations

Ethics approval and consent to participate

These study protocols were approved by the Medical Ethics Committee of the First Affiliated Hospital, College of Medicine, Zhejiang University.

Consent for publication

All patients gave informed consent.

Availability of data and material

The dataset supporting the conclusions of this article is included within the article.

Competing Interests

The authors declare that they have no competing interests.

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References

1. Chen N ZM, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Xia J, Yu T, Zhang X, Zhang L. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet 2020; 395: 507-513. DOI: 10.1016/S0140-6736(20)30211-7.
2. WHO Novel coronavirus (2019-nCoV) situation report 11. Jan 31, 2020. https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200131-sitrep-11-ncov.pdf?sfvrsn=de7c0f7_4.
3. WHO. Coronavirus disease (COVID-19) outbreak situation, https://www.who.int/emergencies/diseases/novel-coronavirus-2019.
4. China Daily. Efficient measures key to containment. Available from, https://www.chinadaily.com.cn/a/202004/07/WS5e8bbf2da3101282172849d0.html.
5. Hangzhou News. Zhejiang Further Lowers Coronavirus Response, Available from: https://en.hangzhou.com.cn/News/content/2020-03/24/content_7701349.htm.
6. Bendibao. [illegible], Available from http://hz.bendibao.com/news/202027/79293.shtm.
7. China Daily. Companies modify production to prioritize masks, protective clothing, Available from: https://www.chinadaily.com.cn/a/202002/08/WS5e3e85e1a310128217275fde.html.
8. China Daily. Automakers join fight against epidemic, Available from: https://www.chinadaily.com.cn/a/202003/02/WS5e5c72a7a31012821727b87a.html.
9. Rosenbloom D and Markard J. A COVID-19 recovery for climate. Science 2020; 368: 447. 2020/05/02. DOI: 10.1126/science.abc4887.
10. Jessop ZM, Dobbs TD, Ali SR, et al. Personal Protective Equipment (PPE) for Surgeons during COVID-19 Pandemic: A Systematic Review of Availability, Usage, and Rationing. Br J Surg 2020 2020/05/13. DOI: 10.1002/bjs.11750.
11. Hollander J and Carr B. Virtually Perfect? Telemedicine for Covid-19. New England Journal of Medicine 2020; 382. DOI: 10.1056/NEJMp2003539.

12. Tanaka MJ, Oh LS, Martin SD, et al. Telemedicine in the Era of COVID-19: The Virtual Orthopaedic Examination. J Bone Joint Surg Am 2020. DOI: 10.2106/JBJS.20.00609.
13. Xiang Y-T, Yang Y, Li W, et al. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. The Lancet Psychiatry 2020; 7: 228-229. DOI: 10.1016/s2215-0366(20)30046-8.
14. Liu S, Yang L, Zhang C, et al. Online mental health services in China during the COVID-19 outbreak. The Lancet Psychiatry 2020; 7: e17-e18. DOI: https://doi.org/10.1016/S2215-0366(20)30077-8.
15. Tan W, Hao F, McIntyre RS, et al. Is returning to work during the COVID-19 pandemic stressful? A study on immediate mental health status and psychoneuroimmunity prevention measures of Chinese workforce. Brain Behav Immun 2020 2020/04/27. DOI: 10.1016/j.bbi.2020.04.055.
16. China Daily. Health QR code helps curb the spread of COVID-19, Available from: https://www.chinadaily.com.cn/a/202003/27/WS5e7dd30da310128217282956.html.
17. Abdelrahman T, Beamish AJ, Brown C, et al. Surgery during the COVID-19 pandemic: operating room suggestions from an international Delphi process. Br J Surg 2020 2020/05/13. DOI: 10.1002/bjs.11747.
18. Iacobucci G. Covid-19: Doctors performing resuscitation need higher level of PPE, says royal college. BMJ 2020; 369: m1644. DOI: 10.1136/bmj.m1644.
19. Xiao Y and Torok ME. Taking the right measures to control COVID-19. Lancet Infect Dis 2020; 20: 523-524. 2020/03/05. DOI: 10.1016/S1473-3099(20)30152-3.
20. Wang J, Feng H, Zhang S, et al. SARS-CoV-2 RNA detection of hospital isolation wards hygiene monitoring during the Coronavirus Disease 2019 outbreak in a Chinese hospital. Int J Infect Dis 2020; 94: 103-106. 2020/04/21. DOI: 10.1016/j.ijid.2020.04.024.
21. Director-General WHO. WHO Director-General's remarks at the media briefing on COVID-2019 outbreak on 14 February 2020, Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-covid-2019-outbreak-on-14-february-2020.

Figures

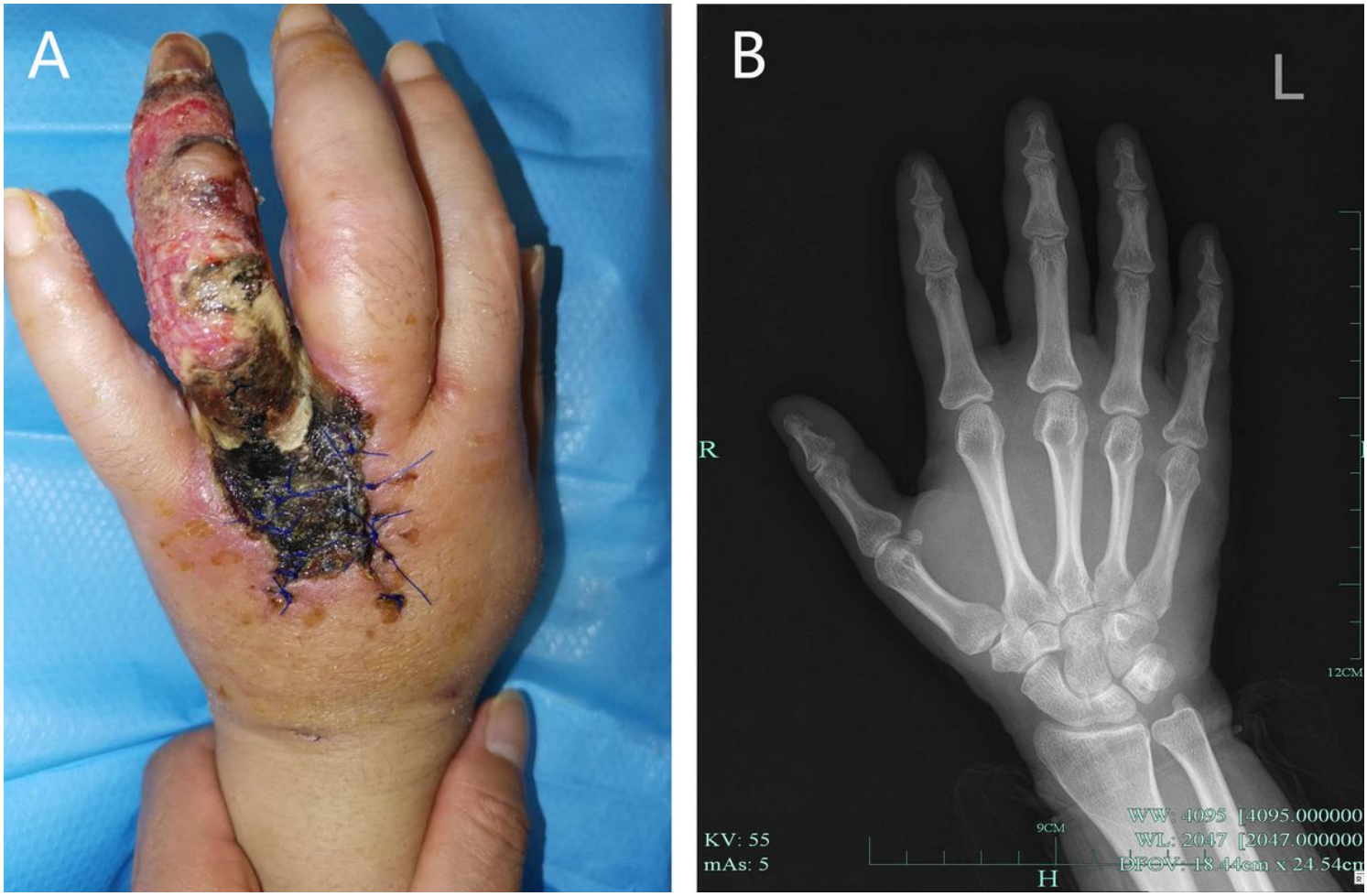

Figure 1

Case 1. A 39-year-old female worker suffered high-pressure disinfectant liquid injection injury of the left ring finger and palm (a) Preoperative appearance of the injured finger. (b) Radiologic appearance of the injured hand.

Figure 2

Case 2. A 52-year-old male driver suffered crush injury while delivering medical supplies (a) Preoperative appearance of the injured hand. (b) Radiologic appearance of the injured hand.

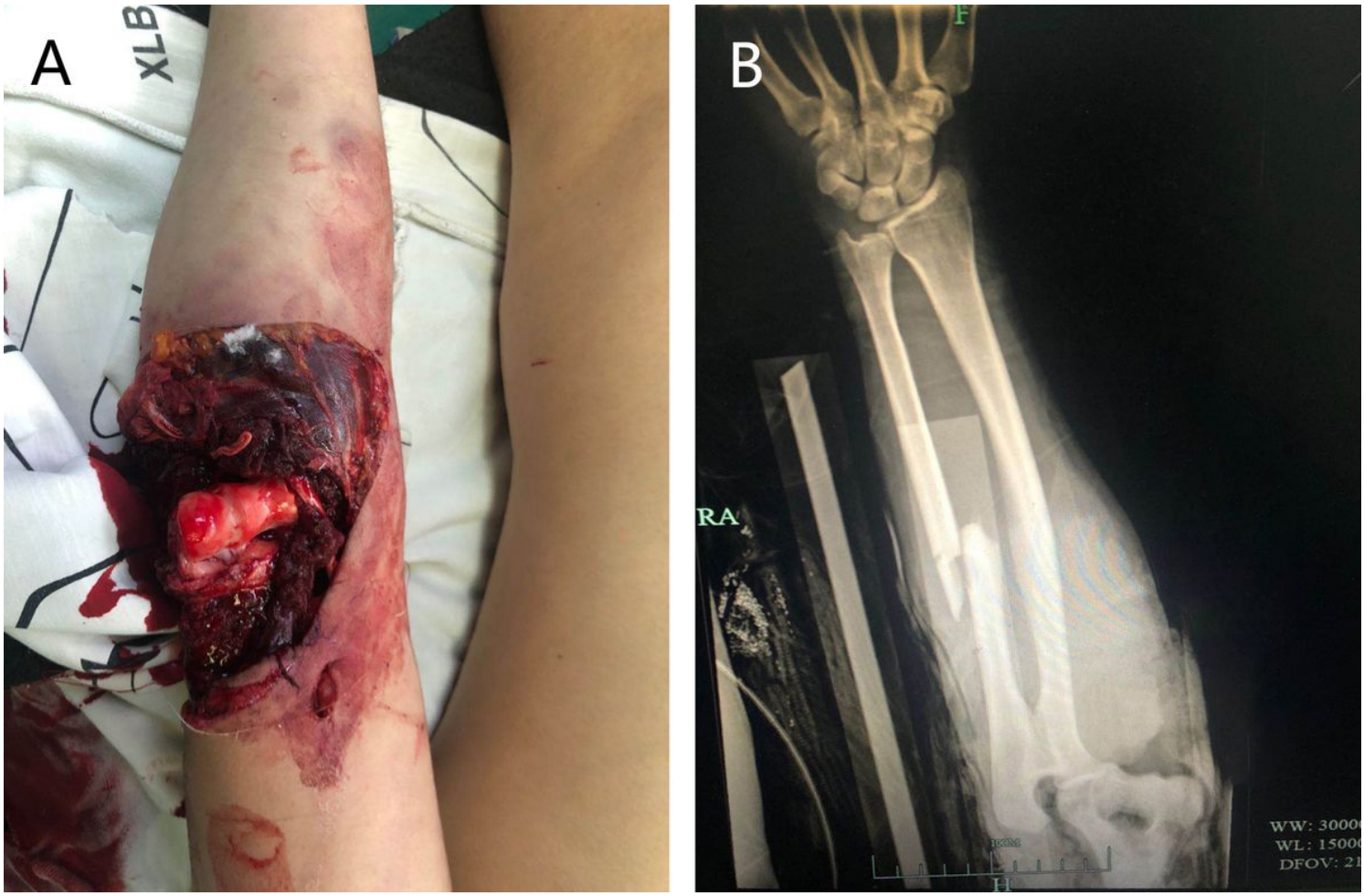

Figure 3

Case 3. A 31-year-old male worker suffered forearm injury caused by the cutting machine in a mask factory (a) Preoperative appearance of the injured arm. (b) Radiologic appearance of the injured arm.