Brief Clinical Report

An emergency surgery in severe case infected by COVID-19 with perforated duodenal bulb ulcer

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Mini-abstract

Performing a surgery for patients with COVID-19 has a high risk to get infected for medical staffs. Here we report a case related to an emergency surgery of COVID-19 with perforated duodenal bulb ulcer with the aim to share our experience.

In December 2019, the outbreak of coronavirus disease 2019 (COVID-19) originated in Wuhan, Hubei Province, spread rapidly to all around the world [1-5]. The outbreak of COVID-19 is getting worse outside China and escalating into a global health emergence [6]. Hospitals are the most dangerous area due to a high risk of getting infected. It is of great significance to strengthen the infection control and protection of medical staffs in hospitals [7-8]. Performing a surgery for patients with COVID-19 is a dilemma and faces a lot of challenges related to the risk of cross infection, secondary infections of the patients. Here, we report a case with COVID-19 who performed an emergency surgery for upper enteron perforation.
Basic clinical characteristics

A 71-year-old man, who had a history of travelling to Wuhan, China, developed fever (38.4°C) and fatigue on February 1. On February 4, chest CT (Figure 1A) showed ground-glass opacities (GGOs) in the lower right lobe, and the patient was instructed to isolate at home. On February 8, the patient was diagnosed as COVID-19 (common type) and admitted to our hospital. The symptomatic treatment was applied. Two days after admission, fever symptom had relieved. But the lesions on chest CT (Figure 1B) progressed in both lungs, and newly developed pleural effusion. The substantially decreased white blood cell and lymphocytes count (1.76×10⁹/L and 0.48 x 10⁹/L), increased CRP (66.30mg/L) indicated a poor prognosis. On February 13, the patient developed the symptoms of abdominal pain, abdominal muscle tension, obvious subxiphoid tenderness. The subsequent emergency chest CT (Figure 1C) showed a further progressed change in both lungs and detected large amounts of air in the abdominal cavity. The upright abdominal plain film also showed infra-diaphragmatic free indicating the upper enteron perforation (Figure 1F). The patient had no history of ulcers, but with underlying disease of high blood pressure and diabetes. As the progress showed on CT images and the newly developed upper enteron perforation, the diagnose of COVID-19 (severe type) was given. After carefully considering the trade-off between emergency situation and high infection risk, an emergency laparoscopic exploration and repair of perforation surgery was scheduled. The family members of the patients were fully informed the high surgical risks.

Surgical procedure management

Firstly, a medical rescue team, grouped by several doctors and nurses, was set up immediately to handle emergency situation. Secondly, a detailed surgical plan was established with the help of multidisciplinary experts, including the way of surgery, the requirement of the surgical room, the route of transporting patient, the protective measures of medical staffs, etc. Specifically, 1) All medical staffs who might contact the patient should be prepared with level 3 protection. 2) special transit channel and negative pressure operating room (negative pressure below -5Pa) met level 3 protection standards were used. Disposable consumables and equipment were used as much as possible during surgery. 3) a skilled laparoscopy expert was assigned to perform the surgery to minimize operating time and reduce the exposure risk. Medical staffs were not allowed to leave the operating room during the surgery.

Intraoperative findings: there is a large amount of yellow pus in the right abdominal cavity and pelvic cavity. A 4cm diameter ulcer perforation was detected in the front wall of the duodenal bulb. After cleaning up the pus liquid, the ulcer perforation was sutured. We washed the abdominal cavity with normal saline, then placed a rubber drainage tube beside the right colon. The operation was successful.

After the patient leaving the surgical room, medical waste was sorted out and labeled as “COVID-19” by medical staff. After spraying the garbage bag with 2000mg/l chlorine disinfectant, all of them were placed at the designated location. Circuit nurses wipe and spray
equipment using chlorine-containing disinfectant. All medical staffs taken off disposable surgical clothing and outer gloves in operating room, then taken off face masks, eye masks, protective clothing, N95 masks in the buffer room. Subsequently, surgical hand was disinfected in inner hallway sink, and medical staffs changed clean clothes after taking a bath in the dressing room. All exposure channels were temporarily closed and disinfected.

Postoperative monitoring

*Medical staff management:* The body temperature and symptoms of the 2 surgeons and 3 circuit nurses were carefully monitored for 3 days. A 14-day preventive medical isolation was performed for the 2 anesthesiologists, considering the high-risk procedure of tracheal intubation during general anesthetic. None of the above medical staffs showed abnormal symptoms.

*Patient management:* The vital signs of patient were closely monitored after surgery. Antibiotic therapy (*e.g.*, broad-spectrum antibiotics and imipenem) were used to prevent the progress of infection, the potential of secondary infection and fungal infection. Xuebijing (Chinese patent medicine) and urinastatin were used to eliminate the inflammatory factors. Hormone therapy should not be the priority treatment due to the risk of aggravating the infection. To restore intestinal function earlier, enema was performed. Breath training device was used to restore the lung function and ankle pump exercise was performed to prevent lower extremity deep venous thrombosis. Other routine treatment and symptomatic treatment were performed.

Clinical outcome

The intestinal function was restored on February 16 and WBC and Lymphocytes counts became normal on February 17. Both the lesions and pleural effusion were absorbed on Chest CT images (Figure 1D). On February 18, the peritoneal cavity drainage tube was removed, and the patient's vital signs became stable. On February 23, the clinical condition of COVID-19 was changed to common type. On February 27, chest CT (Figure 1E) showed an improved condition. Negative RT-PCR test results were found on February 27 and 28. The detailed information of the case were described on Table 1.

This is the first case report of a patient with severe COVID-19 who performed emergency surgery in Hunan province. Adequate preoperative preparation, strict protective measures and careful postoperative care matter in the clinical practice. No cross infection has happened, and the patient has recovered well after surgery. We hope that this successful treatment experience can provide practical guidance for patients with COVID-19 requiring emergency surgery.
References:

1. Xu X, Chen P, Wang J, et al. Evolution of the novel coronavirus from the ongoing Wuhan outbreak and modeling of its spike protein for risk of human transmission[J/OL]. Sci China Life Sci 63, https://doi.org/10.1007/s11427-020-1637-5.

2. Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., ... & Zhao, Y. (2020). Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. Jama.

3. Chan, J. F. W., Yuan, S., Kok, K. H., To, K. K. W., Chu, H., Yang, J., ... & Tsoi, H. W. (2020). A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. The Lancet, 395(10223), 514-523.

4. Zhou, D., Zhang, P., Bao, C., Zhang, Y., & Zhu, N. (2020). Emerging Understanding of Etiology and Epidemiology of the Novel Coronavirus (COVID-19) infection in Wuhan, China.

5. Zu, Z. Y., Jiang, M. D., Xu, P. P., Chen, W., Ni, Q. Q., Lu, G. M., & Zhang, L. J. (2020). Coronavirus Disease 2019 (COVID-19): A Perspective from China. Radiology, 200490.

6. Cheng ZJ, Shan J. 2019 Novel coronavirus: where we are and what we know. Infection. 2020. Epub 2020/02/20.doi:10.1007/s15010-020-01401-y. PubMed PMID:32072569.

7. Bouadma, L., Lescure, F., Lucet, J. et al. Severe SARS-CoV-2 infections: practical considerations and management strategy for intensivists. Intensive Care Med (2020).

8. Qiu, H., Tong, Z., Ma, P. et al. Intensive care during the coronavirus epidemic. Intensive Care Med (2020).
Figure legend:
Figure 1: Series chest CT scans show the extent of lung lesions enlarged before Feb 13 and absorbed after surgery (A-E) and the upright abdominal plain film on Feb 13 shows infra-diaphragmatic free indicating the upper enteron perforation.

Table 1: Information of the COVID-19 surgery case throughout the time.

| Setting                      | Feb.1 | Feb.4 | Feb.8 | Feb.10 | Feb.13 | Feb.13—surgery | Feb.14-27 | Feb.28 |
|------------------------------|-------|-------|-------|--------|--------|----------------|-----------|--------|
| **Clinical factors**         |       |       |       |        |        |                |           |        |
| Patient(R, 45)               |       |       |       |        |        |                |           |        |
| • Positive RT-PCR            |       |       |       |        |        |                |           |        |
| • Fever symptom relieved     |       |       |       |        |        |                |           |        |
| • WBC and lymphocytes count decreased | |       |       |        |        |                |           |        |
| • Electrolyte disorders      |       |       |       |        |        |                |           |        |
| • Abdominal pain             |       |       |       |        |        |                |           |        |
| • Abdominal tenderness       |       |       |       |        |        |                |           |        |
| • Abdominal rebound pain     |       |       |       |        |        |                |           |        |
| • High bile pressure         |       |       |       |        |        |                |           |        |
| • High bilirubin              |       |       |       |        |        |                |           |        |
| • Leukocyte count increased  |       |       |       |        |        |                |           |        |
| • Platelet count decreased   |       |       |       |        |        |                |           |        |
| **CT findings**              |       |       |       |        |        |                |           |        |
| Gas in the right lower lobe |       |       |       |        |        |                |           |        |
| Progression in both lungs    |       |       |       |        |        |                |           |        |
| Newly developed pleural effusion |   |       |       |        |        |                |           |        |
| Lesions progressed           |       |       |       |        |        |                |           |        |
| Lesions resolved             |       |       |       |        |        |                |           |        |
| **Diagnosis and Treatment**  |       |       |       |        |        |                |           |        |
| Isolation at home            |       |       |       |        |        |                |           |        |
| Isolation treatment in hospital |   |       |       |        |        |                |           |        |
| COVID-19 (common type)       |       |       |       |        |        |                |           |        |
| Antibiotic treatment         |       |       |       |        |        |                |           |        |
| Multiple prophylactic (meropenem) | |       |       |        |        |                |           |        |
| Acute respiratory distress   |       |       |       |        |        |                |           |        |
| COVID-19 (Severe type)       |       |       |       |        |        |                |           |        |
| Emergency laparoscopic exploration and repair of perforation surgery | |       |       |        |        |                |           |        |
| Breasts and abdominal cavity |       |       |       |        |        |                |           |        |
| **Preoperative preparation** |       |       |       |        |        |                |           |        |
| • Establish a movement team  |       |       |       |        |        |                |           |        |
| • Make a surgery plan        |       |       |       |        |        |                |           |        |
| • Spinal transit channel and negative pressure operating area | |       |       |        |        |                |           |        |
| **Surgical management**      |       |       |       |        |        |                |           |        |
| • Strictly follow the surgical workflow for patients with COVID-19 | |       |       |        |        |                |           |        |
| • A skilled laparoscopy operator | |       |       |        |        |                |           |        |
| • Using disposable consumables and equipment | |       |       |        |        |                |           |        |
| • Doctors and nurses were protected at level 3 | |       |       |        |        |                |           |        |
| **Postoperative management** |       |       |       |        |        |                |           |        |
| All exposed elements were temporarily covered and disinfected after surgery | |       |       |        |        |                |           |        |
| All medical staffs were closely monitored after surgery | |       |       |        |        |                |           |        |
| All surgical wounds were disinfected and placed at the designated location | |       |       |        |        |                |           |        |