

ULOGA HIRURGA ZA VREME KOVID-19 PANDEMIJE – ISKUSTVA HIRURŠKE KLINIKE KLINIČKO BOLNIČKOG CENTRA “ZEMUN”

ORIGINALNI RAD

ORIGINAL ARTICLE

THE ROLE OF SURGEONS DURING THE COVID-19 PANDEMIC - THE EXPERIENCE OF THE SURGERY CLINIC OF THE CLINICAL HOSPITAL CENTER ZEMUN

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SAŽETAK

Uvod: U decembru mesecu 2019. godine, otkriveno je postojanje nove vrste oboljenja, izazvane SARS koronavirusom 2 (SARS-CoV-2), u gradu Vuhanu, u Republici Kini. Ovo oboljenje karakteriše veliki broj pacijenata sa srednje teškom i teškom kliničkom slikom, koji zahtevaju bolničko lečenje. Organizacija zdravstvenog sistema Srbije u pomenutoj pandemiji, zbog velikog broja obolelih, zahtevala je angažovanje svih lekara, bez obzira na specijalnost. Hirurzi svih službi, Hirurške klinike KBC „Zemun“, bili su neposredno angažovani u lečenju, kako primarnih manifestacija korone, tako i brojnih hirurških komplikacija nastalih na terenu ovog oboljenja, ali i primarnih akutnih hirurških oboljenja kod KOVID-19 pozitivnih pacijenata.

Cilj: Cilj ovog rada je prikaz rada Hirurške klinike, KBC „Zemun“ u uslovima KOVID-19 pandemije, kao i prikaz rezultata operativnog lečenja koje smo sproveli kod obolelih od KOVID-19 infekcije.

Metode: Ovo istraživanje je koncipirano kao retrospektivna studija, sprovedena u periodu od februara 2020. godine do aprila 2021. godine, kod pacijenata koji su bili podvrgnuti urgentnoj hirurškoj intervenciji, a kod kojih je prethodno verifikovana KOVID-19 infekcija. U studiji je učestvovalo ukupno 232 hirurški tretirana pacijenta, na nivou cele Klinike za hirurgiju KBC „Zemun“.

Rezultati: Drenaža grudnog koša, zbog razvoja pneumotoraksa, činila je četvrtinu svih intervencija, dok je hirurško lečenje preduzeto u 53,85% slučajeva zbog akutnog abdomena različite etiologije, odnosno zbog vaskularnih oboljenja u 21,15% slučajeva.

Zaključak: KOVID-19 pandemija je, sama po sebi, veliki izazov za celokupno zdravstvo. Uloga hirurga je velika, kako u organizaciji tako i neposrednom lečenju, koje je dodatno otežano specifičnošću celokupne situacije i težinom samog oboljenja. Pored angažovanja hirurga u lečenju same KOVID-19 infekcije, hirurzi su bili angažovani, u velikom broju slučajeva, na svojoj primarnoj delatnosti u zdravstvenoj zaštiti, u lečenju hirurških oboljenja i komplikacija KOVID-19 oboljenja, sprovodeći zahtevne operativne procedure u veoma teškim i specifičnim uslovima.

Cljučne reči: KOVID-19, hirurg

ABSTRACT

Introduction: In December 2019, the existence of a new type of disease, caused by SARS coronavirus 2 (SARS-CoV-2), was discovered in the city of Wuhan, the Republic of China. The disease itself is characterized by a large number of patients with moderate and severe clinical presentation, who require hospital treatment. The organization of the healthcare system of Serbia, during the aforementioned pandemic, has required the engagement of all doctors, regardless of their specialty, in the treatment of patients with COVID-19. Surgeons of all branches, from the Surgery Clinic of the Clinical Hospital Center Zemun, were directly engaged in the treatment of both primary manifestations of the virus and the numerous surgical complications arising in the wake of this disease, but also in the treatment of primary acute surgical diseases in COVID-19-positive patients.

Aim: The aim of this paper is to present the functioning of the Surgery Clinic of CHC Zemun, in the conditions of the COVID-19 pandemic, as well as to present the types and results of surgical procedures performed in patients with the COVID-19 infection.

Methods: This study was conceived as a retrospective study and was conducted in the period between February 2020 and April 2021, in patients who had undergone emergency surgery and in whom the COVID-19 infection had previously been verified. A total of 232 patients surgically treated at the level of the entire Surgery Clinic of the CHC Zemun participated in the study.

Results: Chest drainage, due to the development of pneumothorax, accounted for a quarter of all surgical procedures performed, while, in 53.85% of cases, surgical treatment was undertaken due to acute abdomen of various etiology, and in 21.15% of cases, due to vascular diseases.

Conclusion: The COVID-19 pandemic is, in itself, a major challenge for the entire healthcare system. The role of the surgeon is significant, both in organization and in direct treatment, which is additionally complicated by the uniqueness of the entire situation and the severity of the disease itself. In addition to their involvement in the treatment of the COVID-19 infection itself, surgeons were, in a large number of cases, engaged in their primary activity in health care, i.e., in the treatment of surgical diseases and complications of COVID-19, performing demanding surgical procedures in very difficult and unique conditions.

Key words: COVID-19, surgery

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UVOD

U decembru mesecu 2019 godine, u gradu Vuhanu, u republici Kini, otkriveno je postojanje nove vrste oboljenja, izazvanog SARS korona 2 virusom (SARS-KoV-2) [1]. Sam početak globalne pandemije SARS-KoV-2 virusa, obeležen je velikom nepoznanicom o samoj prirodni virusa, njegovom biološkom ponašanju, kao i o lečenju KOVID-19 oboljenja. Do ovog trenutka, u svetu je dijagnostikovano oko 175.000.000 obolelih, sa smrtnim ishodom kod skoro 3,8 miliona ljudi. U Srbiji je do sada dijagnostikovano 716.000 obolelih i 7.013 preminulih, što, prema podacima Instituta za javno zdravlje, čini 0,98% smrtnih ishoda od ovog oboljenja.

Tokom odmicanja pandemije dokazan je visok potencijal prenosivosti ovog oboljenja, prilično visoka stopa morbiditeta, kao i mortaliteta. Verifikovani su najčešći simptomi ovog oboljenja: suv kašalj, malaksalost, bolovi u muskulaturi, povišena telesna temperatura, gubitak čula ukusa i mirisa, itd. Dijagnostika se u najvećem broju slučajeva bazira na radiografskim i CT skenerskim potvrdama, kako jednostranih, tako i obostranih zapaljenja pluća. Samo oboljenje karakteriše i relativno veliki broj pratećih komplikacija, posebno kod pacijenata sa prethodnim komorbiditetima, što iziskuje multidisciplinarni pristup u lečenju ovih pacijenta, uključivanjem lekara više različitih specijalnosti medicine. Među najtežim komplikacijama izdvajaju se nastanak poremećaja srčanog ritma, akutne bubrežne insuficijencije, septičnih stanja, vaskularnih ishemijskih poremećaja na nivou različitih organskih sistema, potom nastanak akutnog respiratornog distres sindroma (ARDS), kao i nastanak naprasne srčane smrti [2,3].

Dužina trajanja ovog oboljenja, kao i njegov pandemijski karakter, zahtevala je od hirurga, pored njihovog angažovanja u tretiranju same KOVID-19 infekcije i njene najčešće manifestacije u vidu pneumonije, da se aktivno uključe i u lečenje brojnih urgentnih hirurških oboljenja nastalih u toku trajanja KOVID-19 oboljenja. Počeli su da se objavljuju radovi koji prikazuju rezultate hirurškog rada za vreme KOVID-19 infekcije. Takva je jedna retrospektivna studija, čiji su autori Lei i saradnici, iz Kine [4], koja je obuhvatila 34 pacijenta operisanih u toku inkubacionog perioda KOVID-19 infekcije, u 4 bolnice, u periodu od 1. januara do 5. februara 2020 godine. Ovom studijom su bili obuhvaćeni pacijenti operisani zbog patologije različitih organskih sistema, npr. resekcija rektalnog i ezofagealnog kancera, transplantacija bubrega, ugradnja proteze kuka, itd. Kod svih pacijenata je u postoperativnom toku dijagnostikovana KOVID-19 pneumonija, ubrzo nakon operacije. Kod čak 44,1% pacijenata bio je neophodan tretman u jedinici intenzivne nege, usled progresije oboljenja, a 20% pacijenata je preminulo nakon prijema u jedinicu

INTRODUCTION

In December 2019, the existence of a new type of disease, caused by SARS coronavirus 2 (SARS-CoV-2), was discovered in the city of Wuhan, the Republic of China [1]. At the beginning of the global pandemic of the SARS-CoV-2 virus, we were entering uncharted territory, as little was known of the nature of the virus itself, its biological behavior, or the way that the COVID-19 disease should be treated. As of this moment, around 175,000,000 people have been diagnosed with COVID-19 worldwide, while 3.8 million have died. According to the data of the Institute for Public Health, until now, in Serbia, 716,000 people have been diagnosed with the disease, while 7,013 have died.

As the pandemic progressed, a high transmission potential of the virus was proven, as well as a rather high morbidity and mortality rate. The following most frequent symptoms of this disease were verified: dry cough, malaise, muscle pain, elevated body temperature, loss of the senses of smell and taste, etc. Diagnostics is, in most cases, based on radiographic and CT scan confirmation of unilateral as well as bilateral pneumonia. The disease itself is also characterized by a relatively large number of associated complications, especially in patients with preexisting comorbidities, which requires a multidisciplinary approach in the treatment of these patients and the involvement of doctors from a number of different medical specialties. The following are amongst the most severe complications: the development of cardiac rhythm disturbance, of acute renal insufficiency, sepsis, vascular ischemic disturbance at the level of different systems of organs, as well as the development of acute respiratory distress syndrome (ARDS) and the occurrence of sudden cardiac death [2,3].

The duration of the disease, as well as its pandemic character, required that surgeons should, in addition to their engagement in the treatment of the COVID-19 infection itself and its most common manifestation, i.e., pneumonia, also be actively involved in the treatment of numerous emergency surgical diseases developing during the course of the COVID-19 disease. The publishing of studies presenting the results of surgical work during COVID-19 infection has started. Such is a retrospective study by Lei et al., from China [4], which included 34 patients surgically treated during the incubation period of COVID-19 infection, in four different hospitals, in the period between January 1 and February 5, 2020. This study involved patients who were surgically treated due to the pathology of different systems of organs, e.g., rectal and esophageal cancer resection, kidney transplantation, hip replacement surgery, etc. In all of the patients, COVID-19 pneumonia was diagnosed soon after the surgery, during postoperative recovery.

intenzivne nege [4]. Takođe, u Iranu je predstavljena retrospektivna studija od 4 pacijenta operisanih za vreme KOVID-19 infekcije, sa dokazanim smrtnim ishodom zbog progresije oboljenja, kod 2 pacijenta [5]. Vredna poena je i jedna od poslednjih velikih multicentričnih prospektivnih studija sprovedenih na polju velike međunarodne saradnje između lekara širom sveta, pod imenom *GlobalSurg Collaborative*. Ova studija je obuhvatila 140.231 operisanog pacijenta iz čak 116 zemalja, a njen cilj je bio da se odredi adekvatan vremenski trenutak za operativno lečenje nakon KOVID-19 infekcije. Pokazano je da rizik od postoperativnog mortaliteta i morbiditeta značajno raste kod pacijenata operisanih unutar 6 nedelja od dijagnostikovane KOVID-19 infekcije [6].

Kada se posmatra sve gore navedeno, kao i činjenica da kod pacijenata sa perioperativnom KOVID-19 infekcijom dokazano raste rizik od plućnih komplikacija i smrtnog ishoda [7,8], jasno se vidi da je sam zadatak hirurga veoma otežan i povezan sa donošenjem još težih odluka nego što je uobičajeno u normalnom režimu rada.

CILJ RADA

Cilj ovog rada je prikaz funkcionisanja Klinike za hirurgiju, u okviru KOVID-19 Bolnice KBC „Zemun“, u usloviima KOVID-19 pandemije, kao i prikaz rezultata operativnog lečenja sprovedenog kod obolelih od KOVID-19 infekcije.

METODE

Ovo istraživanje je osmišljeno kao retrospektivna studija sprovedena u periodu od februara 2020. do aprila 2021. godine, kod pacijenata koji su bili podvrgnuti urgentnoj operaciji zbog komplikacija nastalih na terenu KOVID-19 infekcije.

U studiji je učestvovalo ukupno 232 pacijenta, koji su hirurški tretirani na nivou cele Hirurške klinike KBC „Zemun“, dok su lekari Službe opšte hirurgije bili angažovani u 156 (67,24%) slučajeva. Kriterijumi uključivanja pacijenata u studiju su bili: pacijenti sa dijagnostikovanom KOVID-19 infekcijom (PCR ili Ag metoda), oba pola, starosno doba preko 18 godina; uz pismeni pristanak za operativno lečenje i nakon odobrenja izvođenja ispitivanja od strane etičkog komiteta KBC „Zemun“.

Preoperativno su svi pacijenti pripremljeni, u smislu urađene kompletne osnovne odnosno dopunske dijagnostike. U okviru dopunske dijagnostike, rađene su dijagnostičke procedure, u smislu CT snimanja ciljanih topografskih regija, doplerskog snimanja magistralnih krvnih sudova ekstremiteta, i rentgenskog i ehosonografskog snimanja abdomena. Svi pacijenti su

In as many as 44.1% of the patients, intensive care treatment was necessary due to illness progression, while 20% of the patients died upon being admitted to the intensive care unit [4]. In Iran, as well, a retrospective study on four patients surgically treated during COVID-19 infection was presented, with a proven lethal outcome, due to the progression of the illness, in 2 of these patients [5]. Also of note is one of the latest large multicentric prospective studies carried out in the context of large-scale global cooperation between doctors around the world, i.e., the *GlobalSurg Collaborative*. This study included 140,231 surgically treated patients from as many as 116 countries, and its aim was to determine the appropriate timing for surgical treatment after COVID- infection. The study has shown that the risk of postoperative mortality and morbidity significantly increases in patients surgically treated within 6 weeks from being diagnosed with the COVID-19 infection [6].

When all the above stated is taken into consideration, as well as the fact that the risk of pulmonary complications and of lethal outcome has been proven to be higher in patients with postoperative COVID-19 infection [7,8], it is clear that the task of the surgeon is thereby made significantly more difficult and is connected to making much more difficult decisions than is customary in the normal course of work.

STUDY AIM

The aim of this study is to present the functioning of the Surgery Clinic, within the COVID-19 Hospital of CHC *Zemun*, in the conditions of the COVID-19 pandemic, as well as to present the results of surgical procedures performed in patients with COVID-19 infection.

METHODS

This paper is designed as a retrospective study, carried out between February 2020 and April 2021, in patients who had undergone emergency surgical procedures due to complications arising within the progression of the COVID-19 disease.

A total of 232 patients, surgically treated at the level of the entire Surgery Clinic of the CHC *Zemun*, were included in the study, while the doctors from the Department of General Surgery were involved in the treatment of 156 (67.24%) cases. The criteria for patient inclusion in the study were as follows: patients with confirmed COVID-19 infection (PCR or Ag test), both sexes, age 18 years and above; with written consent for surgical treatment and upon granted approval for the study by the ethics committee of CHC *Zemun*.

All patients were preoperatively prepared, in the sense that, for all of them, complete basic and additional diagnostics was carried out. Within additional

preoperativno pregledani od strane interniste i anesteziologa, da bi se doveli u optimalno stanje za operativno lečenje.

U ovoj studiji korišćene su deskriptivne statističke metode: apsolutni i relativni brojevi (n,%), mere centralne tendencije (aritmetička sredina, medijana). Protokol istraživanja je bio sledeći: podaci koji su bili potrebni za ovu studiju su uzimani iz protokola operativnog lečenja, istorija bolesti pacijenata, temperaturnih lista pacijenata, anestezioloških lista vođenja operativnog lečenja, i izveštaja patologa.

REZULTATI

Od ukupnog broja hospitalizovanih pacijenata u KBC „Zemun“ za vreme funkcionisanja Ustanove unutar KOVID-19 sistema, kod 232 pacijenta je sprovedeno hirurško lečenje, najkasnije do 48 sati od prijema odnosno razvoja kliničke slike. Deo pacijenata je već bio hospitalizovan u našoj ustanovi, dok je ostatak primljen po pregledu u trijažnoj ambulanti, odnosno upućen iz drugih ustanova unutar ili van KOVID-19 sistema. Kod svih pacijenata je verifikovana SARS-KoV-2 infekcija,

diagnostics, certain diagnostic procedures were undertaken, i.e., CT imaging of targeted topographic regions, doppler imaging of major blood vessels in the extremities, and X-ray and ultrasound imaging of the abdomen. All patients were preoperatively examined by an internist and anesthesiologist, in order to be optimally stabilized for surgical treatment.

Descriptive statistical methods: absolute and relative numbers (n, %), as well as measures of central tendency (arithmetic mean, median value), were applied in the study. The research protocol was as follows: data necessary for the study were taken from surgery protocols, patient histories, patient temperature charts, anesthesia charts of surgical treatment, and pathology reports.

RESULTS

Of the total number of in-patients treated at the CHC Zemun during its operation within the COVID-19 system, in 232 cases surgical treatment was carried out within 48 hours of admission, i.e., the development of clinical presentation. A certain number of these patients were already

Tabela 1. Podaci o operisanim pacijentima u KOVID bolnici KBC „Zemun“ u okviru Službe opšte hirurgije

Table 1. Data on patients operated on at the COVID Hospital of the CHS Zemun within the Department of General Surgery

Dužina anamneze / Length of anamnesis	do 48h / Up to 48h
Pol / Sex	
Muški / Male	94 (60,25%)
Ženski / Female	62 (39,75%)
Starost pacijenata (medijana - 73,5 godina) / Patient age (median age – 73.5 years)	
Najmlađi / Youngest	21 godina
Najstariji / Youngest	84 godine
Pneumonija / Pneumonia	
Pozitivan nalaz / Positive finding	109 (69,87%)
Negativan nalaz / Negative finding	47 (30,13%)
PCR nalaz / PCR finding	
Pozitivan nalaz / Positive finding	125 (80,13%)
Negativan nalaz / Negative finding	31 (19,87%)
Antigenski nalaz / Antigen finding	
Pozitivan nalaz / Positive finding	96 (61,54%)
Negativan nalaz / Negative finding	62 (38,46%)
Komplikacije u postoperativnom toku / Postoperative complications	
Infekcija rane / Wound infection	3 (1,92%)
Dehiscencija rane / Wound dehiscence	6 (3,85%)
Krvarenje / Bleeding	5 (3,20%)
Dehiscencija anastomoze / Anastomotic dehiscence	1 (0,64%)
Mortalitet / Mortality	21 (13,46%)

uz pozitivan PCR nalaz u 80,13% slučajeva i/ili pozitivan Ag test u 61,54% slučajeva. Postojanje bilateralne pneumonije je bilo potvrđeno kod 109 pacijenata (69,87%), dok su ostali imali simptome blagog intenziteta uz odsustvo radiografske verifikacije. Starost pacijenata se kretala u rasponu između 21 i 84 godine, sa medijanom od 73,5 godina. Ukupno 60,25% pacijenata je bilo muškog pola (Tabela 1).

Dominantna intervencija bila je drenaža grudnog koša zbog razvoja pneumotoraksa, čineći četvrtinu

in-patients at CHC Zemun, while the rest of them were admitted to hospital, either upon examination at the triage examination room or were referred from other hospitals from or outside the COVID-19 system. The SARS-CoV-2 infection was confirmed in all patients, with a positive PCR test result in 80.13% of the cases, and/or a positive Ag test result in 61.54% of the cases. Bilateral pneumonia was confirmed in 109 patients (69.87%), while the rest of the patients had symptoms of mild intensity with an absence of radiographic

Tabela 2. Tip operacije i broj operacija, po službama, obavljen u KOVID bolnici KBC „Zemun“

Table 2. Type of surgery and number of procedures, by department, performed at the COVID Hospital of CHC Zemun

Tip operacije po službi	Ukupan broj operacija po tipu	Procenat u odnosu na službu	Procenat u odnosu na broj ukupno operisanih
Type of surgery, by department	Total number of procedures, by type	Percentage in relation to the department	Percentage in relation to the total number of surgically treated patients
Služba opšte hirurgije / Department of General Surgery	156	100%	67,24%
Toralna drenaža / Thoracic drainage	39	25%	
Apendektomija / Appendectomy	20	12,82%	
Sutura perforiranog ulkusa / Suture of perforated ulcer	22	14,10%	
Operacija po Hartmann-u / Hartmann's operation	12	7,70%	
Resekcija creva sa anastomozom / Resection and anastomosis of the bowel	9	5,77%	
Bipolarna ileostoma ili kolostoma / Bipolar ileostomy or colostomy	17	10,90%	
Trombektomija / Thrombectomy	8	5,13%	
Amputacija DE / LE amputation	25	16,02%	
Retroperitonealni hematoma / Retroperitoneal hematoma	4	2,56%	
Služba otorinolaringologije / ENT Department	38	100%	16,38%
Traheostoma / Tracheostomy	31	81,58%	
Intervencija zbog epistakse / Surgical procedure for epistaxis	7	18,42%	
Služba ortopedije sa traumatologijom / Department of Orthopedics and Trauma Surgery	13	100%	5,60%
Osteosinteza / Osteosynthesis	13	100%	
Služba neurohirurgije / Department of Neurosurgery	16	100%	6,90%
Operacija zbog intrakranijalnog krvarenja / Surgical procedure for intracranial bleeding	16	100%	
Služba urologije / Department of Urology	9	100%	3,88%
TUR zbog perzistentne hematurije / TUR for persistent hematuria	9	100%	
UKUPNO / TOTAL	232	100%	100%

Legenda: DE – donji ekstremitet; TUR – transuretralna resekcija

Legend: LE – lower extremity; TUR – transurethral resection

svih operacija, dok je hirurško lečenje preduzeto u 53,85% slučajeva, zbog kliničke slike akutnog abdomena različite etiologije, odnosno zbog postojanja ili nastanka vaskularnih komplikacija u 21,15% slučajeva. Ukupno je izvršeno 25 amputacija donjih ekstremiteta. U ovu studiju nisu uključeni pacijenti sa dijagnostikovanim retroperitonealnim hematoma, kojih je bilo 30, a tretirani su konzervativnom terapijom. U gotovo svim slučajevima retroperitonealni hematoma je nastao kao posledica agresivne antikoagulantne terapije, koja je ordinirana zbog visokog stepena tromboembolijskih komplikacija koje ovo oboljenje nosi sa sobom. Ukupno 38 (16,38%) pacijenata je zahtevalo angažman specijaliste otorinolaringologije, najčešće zbog izvođenja traheostome, usled produžene intubacije, ali i zbog javljanja epistakse. Ortopedsko lečenje je obuhvatalo operacije osteosinteze, neurohirurško lečenje je sprovedeno radi zbrinjavanja intrakranijalnih krvarenja, dok je urološko lečenje preduzimano zbog perzistentne hematurije (Tabela 2).

U postoperativnom toku, zabeležili smo postojanje komplikacija kod 15 (9,61%) pacijenata. Najzastupljenija je bila dehiscencija operativne rane, u 3,85% slučajeva, prvenstveno zbog pridruženog i izraženog kašlja, potom recidivno krvarenje u zbrinjavanju pacijenata sa retroperitonealnim hematoma i krvarećim ulkusima, a kao posledica administracije visokih doza antikoagulantne terapije (3,20%). Infekcija rane i dehiscencija anastomoze je zabeležena u manje od 2% slučajeva. Sve dehiscencije operativnih rana i anastomoza su tretirane reoperacijom. Kod svih trombektomisanih pacijenata, retromboza se desila unutar 48 sati. Ukupni mortalitet je iznosio 13,46% i dominantno je bio zastupljen kod starijih pacijenata ili onih sa pridruženim komorbiditetima, a oslikava pre svega težinu kliničke slike KOVID-19 infekcije, a potom i opterećenost dodatnom komplikacijom ili akutnim hirurškim oboljenjem (Tabela 1).

DISKUSIJA

Generalno, i očekivano za ovo oboljenje, najveći problem i najveće komplikacije su nastajale na nivou respiratornog trakta. Kod pacijenata na mehaničkoj ventilatornoj potpori je u velikoj meri nastajala komplikacija u vidu pneumotoraksa. Pojavili su se radovi koji pokazuju da, u velikoj meri, barotrauma, nastala usled prolongirane ventilacije, kod pacijenta dovodi do pneumotoraksa, sa ili bez udruženog pneumomediastinuma, u čak 15% slučajeva [8]. U našoj studiji je čak 39 pacijenata tretirano torakalnom drenažom zbog pneumotoraksa, što čini čak 25% pacijenata tretiranih od strane opštih hirurga. Našom studijom nismo

verifikovali. The age of the patients ranged from 21 to 84 years, with the median value being 73.5 years. A total of 60.25% of the patients were male (Table 1).

The predominant procedure was chest drainage due to the development of pneumothorax, accounting for one quarter of all surgical procedures, while surgical treatment was carried out in 53.85% of the cases due to clinical presentation of acute abdomen of different etiology, and in 21.15% of the cases due to the existence or development of vascular complications. A total of 25 amputations of lower extremities was performed. Patients with diagnosed retroperitoneal hematoma – there were 30 such patients - were not involved in the study, and they were treated with conservative therapy. In almost all cases, retroperitoneal hematoma developed as the result of aggressive anticoagulation therapy, administered due to a high level of thromboembolic complications connected to this disease. A total of 38 (16.38%) patients required treatment by an ENT specialist, most frequently for performing tracheostomy, due to prolonged intubation, but also due to the occurrence of epistaxis. Orthopedic treatment involved osteosynthesis procedures, neurosurgical treatment was performed in cases of intracranial bleeding, while urological treatment was carried out for persistent hematuria (Table 2).

In postoperative recovery, the occurrence of complications was registered in 15 (9.61%) patients. Surgical wound dehiscence was the most common one, occurring in 3.85% of the cases, primarily due to associated and pronounced coughing, followed by recurring bleeding in the treatment of patients with retroperitoneal hematoma and bleeding ulcers, resulting from the administration of high dose anticoagulant therapy (3.20%). Wound infection and anastomosis dehiscence was registered in less than 2% of the cases. All cases of surgical wound and anastomosis dehiscence were treated with reoperation. In all thrombectomy patients, rethrombosis occurred within 48 hours. Overall mortality was 13.46% and occurred predominately in older patients or those with associated comorbidities, primarily reflecting the severity of the clinical presentation of the COVID-19 infection, but also the burden of additional complication or an acute surgical condition (Table 1).

DISCUSSION

Generally speaking, and as to be expected for this disease, the greatest problem and the most severe complications occurred at the level of the respiratory tract. In patients on mechanical ventilation, the complication in the form of pneumothorax occurred to a great extent. Papers have been published showing that, largely, barotrauma, caused by prolonged ventilation,

obuhvatili manji broj pacijenata koji je tretiran konzervativno, usled nastanka parcijalnog pneumotoraksa.

Što se tiče tromboembolijskih dešavanja na nivou ekstremiteta, pored klasičnih faktora koji utiču na tromboembolijske događaje, posebni patofiziološki mehanizmi u toku KOVID-19 infekcije doprinose povećanom riziku od nastanka ovih događaja, pa je tako pokazana povećana sklonost nastanka i arterijskih i venskih tromboza. Trenutno se smatra da sam SARS-KoV-2 virus dovodi do povećanja rizika, usled izazivanja ekscitivnog inflamatornog odgovora, poremećaja na nivou samog krvnog protoka, kao i direktnim aktiviranjem trombocita i narušavanjem integriteta endotela [9]. Tako je, u našoj studiji, kod 8 pacijenata urađena trombektomija, kod 7 pacijenata na donjim ekstremitetima, a kod jednog pacijenta na gornjem ekstremitetu. Kod svih pacijenata je došlo do retromboze unutar 48 sati, usprkos primeni adekvatne konzervativne terapije. Kod 25 pacijenata je urađeno amputaciono lečenje na nivou donjih ekstremiteta, usled prolongirane ishemijske ekstremiteta i kontraindikovanog pokušaja za trombektomiju ili samog spašavanja ekstremiteta.

Osvrtom na komplikacije unutar digestivnog trakta kod kritično obolelih pacijenata od KOVID-19 infekcije, u studiji iz Masačusetske Opšte Bolnice (engl. *Massachusetts General Hospital*) [10] pokazano je da je kod čak 75% pacijenata (ukupno 141 pacijent je obuhvaćen ovom studijom) došlo do razvoja bar jedne gastrointestinalne komplikacije. Kod čak 56% pacijenata dijagnostikovani su problemi sa motilitetom creva i razvojem ileusa, dok je kod 4 pacijenata dijagnostikovana ishemija creva [10].

U našoj studiji je prikazano naše iskustvo u rešavanju i lečenju urgentnih hirurških oboljenja kod pacijenata obolelih od KOVID-19 infekcije. Operisani su pacijenti sa razvijenim kliničkim slikama akutnog abdomena na terenu akutnog apendicitisa, potom ileusa, kao posledice mehaničke opstrukcije na terenu kolorektalnog karcinoma.

Što se tiče komplikacija samih hirurških procedura, u jednoj studiji rumunskih autora, poređeni su pacijenti operisani za vreme KOVID-19 infekcije, od aprila do jula 2020. godine, i pacijenti operisani 2019. godine, u toku istog perioda. Dobijen je zanimljiv podatak - infekcije rane su bile zastupljene u 2% kod operisanih za vreme KOVID-19 pandemije, naspram 13,95% u toku istog perioda 2019 godine [11]. U našoj studiji je 2% pacijenata operisanih od strane opštih hirurga razvilo kliničku sliku infekcije operativne rane, s tim što su svi operisani imali potvrđenu KOVID-19 infekciju.

ZAKLJUČAK

KOVID-19 pandemija je, sama po sebi, veliki izazov za celokupno zdravlje. Uloga hirurga je velika, kako u

leads to pneumothorax, with or without accompanying pneumomediastinum, in as many as 15% of cases [8]. In our study, 39 patients were treated with chest drainage due to pneumothorax, which is as many as 25% of patients treated by general surgeons. Our study did not involve a smaller number of patients treated conservatively for partial pneumothorax.

Regarding thromboembolic events at the level of the extremities, in addition to the standard factors affecting thromboembolic events, special pathophysiological mechanisms in the course of the COVID-19 infection also contribute to increased risk of the occurrence of these events. Thus, a greater tendency towards the development of both venous and arterial thromboses has been demonstrated. At the present time, it is believed that the SARS-CoV-2 virus itself leads to increased risk, as it causes excessive inflammatory response, disturbance at the level of blood flow itself, as well as direct thrombocyte activation and the disruption of endothelial integrity [9]. Thus, in our study, thrombectomy was performed in 8 patients; in 7 cases it was in the lower extremities, and in one patient in one of the upper extremities. Retrombosis occurred in all patients within 48 hours, despite the administration of appropriate conservative therapy. In 25 patients, lower extremity amputation was performed, due to prolonged ischemia of the extremity and contraindicated attempt of thrombectomy or salvaging the extremity.

An overview of the complications within the digestive tract in critically ill COVID-19 patients, in a study from the Massachusetts General Hospital [10] showed that as many as 75% of patients (a total of 141 patients were involved in the study) developed at least one gastrointestinal complication. In as many as 56% of the patients intestinal motility problems and ileus development were diagnosed, while in 4 patients intestinal ischemia was identified [10].

In our study, we have presented our experience in resolving and treating emergency surgical diseases in COVID-19 patients. Patients with developed clinical presentation of acute abdomen occurring in acute appendicitis, and ileus, as the result of mechanical obstruction within the presentation of colorectal cancer, were surgically treated.

As far as complications of the surgical procedures themselves are concerned, a study by Romanian authors compared patients surgically treated during the COVID-19 infection, between April and July 2020, and patients who had undergone surgical procedures in the same months of 2019. Interesting results were obtained – surgical wound infection occurred in 2% of patients surgically treated during the COVID-19 pandemic, as opposed to 13.95% of surgical wound infections

organizaciji tako i neposrednom lečenju, koje je dodatno otežano specifičnošću celokupne situacije i težinom samog oboljenja. Pored angažovanja hirurga u lečenju same KOVID-19 infekcije, hirurzi su bili angažovani u velikom broju slučajeva na svojoj primarnoj delatnosti u zdravstvenoj zaštiti, u lečenju hirurških oboljenja i komplikacija KOVID-19 oboljenja, sprovodeći zahtevne operativne procedure u veoma teškim i specifičnim uslovima.

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LITERATURA / REFERENCES

1. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. *N Engl J Med.* 2020;382(8):727–33.
2. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet.* 2020;395(10223):497–506.
3. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet.* 2020;395(10223):507–13.
4. Lei S, Jiang F, Su W, Chen C, Chen J, Mei W, et al. Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection. *EClinicalMedicine.* 2020;21:100331.
5. Aminian A, Safari S, Razeghian-Jahromi A, Ghorbani M, Delaney CP. COVID-19 Outbreak and Surgical Practice: Unexpected Fatality in Perioperative Period. *Ann Surg.* 2020;272(1):e27–9.
6. COVIDSurg Collaborative; GlobalSurg Collaborative. Timing of surgery following SARS-CoV-2 infection: an international prospective cohort study. *Anaesthesia.* 2021 Jun;76(6):748–58.
7. Bhangu A, Nepogodiev D, Glasbey JC, Li E, Omar OM, Gujjuri RR, et al. Mortality and pulmonary complications in patients undergoing surgery with perioperative sars-cov-2 infection: An international cohort study. *Lancet.* 2020;396(10243):27–38.
8. McGuinness G, Zhan C, Rosenberg N, Azour L, Wickstrom M, Mason DM, et al. Increased incidence of barotrauma in patients with COVID-19 on invasive mechanical ventilation. *Radiology.* 2020;297(2):E252–62.
9. Casale M, Dattilo G, Imbalzano E, Gigliotti De Fazio M, Morabito C, Mezzetti M, et al. The thromboembolism in COVID-19: the unsolved problem. *Panminerva Med.* 2020;
10. El Moheb M, Naar L, Christensen MA, Kapoen C, Maurer LR, Farhat M, Kaafarani HMA. Gastrointestinal Complications in Critically Ill Patients With and Without COVID-19. *JAMA.* 2020 Nov 10;324(18):1899–901.
11. Serban D, Socea B, Badiu CD, Tudor C, Balasescu SA, Dumitrescu D, et al. Acute surgical abdomen during the COVID-19 pandemic: Clinical and therapeutic challenges. *Exp Ther Med.* 2021 May;21(5):519.

in patients treated in the same months of 2019 [11]. In our study, 2% of patients treated by general surgeons developed the clinical presentation of surgical wound infection, however, all of the surgically treated patients also had confirmed COVID-19 infection.

CONCLUSION

In itself, the COVID-19 infection is a great challenge for the entire healthcare system. The role of the surgeon is very important, not only in organization, but also in direct treatment, which is additionally made more difficult by the singularity of the overall situation and the severity of the disease itself. In addition to their involvement in the treatment of the COVID-19 infection itself, surgeons were, in a large number of cases, engaged in their primary activity in health care, i.e., in the treatment of surgical diseases and complications of COVID-19, performing demanding surgical procedures in very difficult and unique conditions.

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