COVID-19 – the current clinical data and a review of recommendations for otolaryngologists and dentists

COVID-19 – aktualne dane kliniczne i przegląd zaleceń dla lekarzy otorynolaryngologów i stomatologów

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ABSTRACT: Despite multidirectional activities in the sphere of politics, health care and limiting direct interpersonal contacts to a minimum, the Covid-19 pandemic has covered the whole world and the number of new cases is rising exponentially. This demonstrates the considerable severity of the situation. The doctors and other health professionals are and will be at the forefront of the fight against the pandemic, being at the same time the group most at risk of infection. SARS-CoV-2 virus infection applies to patients of all ages, with a median age of 49–59 years. The most common complaints in patients with Covid-19 include fever, caught, dyspnea, general malaise and muscle aches. The course of Covid-19 may include pneumonia, which is moderate to severe in about 20% of cases and is associated with respiratory distress. Of significance to otorhinolaryngologists are reports of smell and taste disorders. Postinfectious loss of smell can affect about 30% of all patients with Covid-19. Confirmation of SARS-CoV-2 infection in patients with symptomatic or epidemiological suspicion of Covid-19 is constituted by genetic tests RT-PCR. Biological material is usually taken from the nose or nasopharynx. The management of Covid-19 is symptomatic since there is currently no specific cure. There is a particularly high risk of transmitting infection from patients to physicians who treat diseases of the respiratory tract or perform any interventions on the upper or lower respiratory tract. Low-symptomatic first stages of the disease with high viral load mean that during the pandemic, scheduled examinations and procedures should be limited. During the examination of patients or their treatment, adequate full PPE protection is indicated, reducing the risk of accidental infection of the treatment team. For the management of patients with confirmed SARS-CoV-2 infection or requiring immediate treatment without the possibility of determining epidemiological factors Covid-19, full protection in PPE is obligatory.

KEYWORDS: aerosol generating surgery, clinical practice guidelines, COVID-19, head and neck surgery, SARS-CoV-2

STRESZCZENIE: Mimo wielokierunkowych działań w sferze polityki, ochrony zdrowia i ograniczania bezpośrednich kontaktów międzyludzkich do minimum, pandemia Covid-19 objęła cały świat, a liczba przypadków tej choroby wzrasta wykładniczo. Świadczy to o niezwykłej powadze sytuacji. Lekarze i inni specjaliści w zakresie ochrony zdrowia są i będą na pierwszej linii walki z pandemią, stanowiąc przy tym grupę najbardziej narażoną na zakażenia. Infekcja wirusem SARS-CoV-2 dotyczy pacjentów w każdym wieku, przy czym mediana wieku chorych wynosi 49–59 lat. Do najczęstszych dolegliwości u osób z Covid-19 należą: gorączka, kaszel z odkrztuszaniem wydzieliny, duszność oraz uczucie ogólnego osłabienia i bóle mięśniowe. W przebiegu Covid-19 dochodzi do zapalenia płuc, które w ok. 20% przypadków ma umiarkowanie ciężki przebieg z zaburzeniami oddechowymi. Istotne z punktu widzenia otorynolaryngologów są także doniesienia o zaburzeniach węchu i smaku, które są stwierdzane u 30% pacjentów. Potwierdzeniem zakażenia SARS-CoV-2 u pacjentów z objawowym lub epidemiologicznym podejrzeniem Covid-19 są testy genetyczne RT-PCR. Materiał biologiczny pobiera się najczęściej z nosa lub nosogardła. Postępowanie w przypadkach Covid-19 jest objawowe, gdyż nie ma obecnie specyficznego leku pozwalającego na wyleczenie. Szczególnie duże ryzyko zakażenia istnieje u lekarzy zajmujących się regionem górnych dróg oddechowych i początkowego odcinka drogi oddechowej. Mało objawowe pierwsze stadia choroby przy dużej zakaźności powodują, że w czasie trwania pandemii planowe badania i zabiegi powinny być ograniczone. Podczas badania pacjentów lub ich leczenia wskazane jest stosowanie osobistego wyposażenia zabezpieczającego, zmniejszając ryzyko przypadkowego zakażenia zespołu leczącego. Przy leczeniu osób z potwierdzoną infekcją SARS-CoV-2 lub wymagających natychmiastowego leczenia, bez możliwości ustalenia czynników epidemiologicznych Covid-19, pełne osobiste wyposażenie zabezpieczające jest konieczne.

SŁOWA KLUCZOWE: COVID-19, otorynolaryngologia, procedury generujące aerozol, SARS-CoV-2, wytyczne postępowania

ABBREVIATIONS

AAO-HNS – American Academy of Otolaryngology – Head and Neck Surgery
ALT i AST – transaminase
ARDS – acute respiratory distress syndrome
BAL – bronchoalveolar lavage
COPD – chronic obstructive pulmonary disease
CPK – creatine phosphokinase
Cr – creatinine
CRP – C-reactive protein
CT – computed tomography
EBV – Epstein-Barr virus
MERS – Middle Eastern respiratory distress syndrome
NHS – National Health Service
PPE – personal protective equipment
r-RT-PCR – reverse transcription polymerase chain reaction
RT-iiPCR – reverse transcription-insulated isothermal polymerase chain reaction
RT-LAMP – reverse transcription loop-mediated isothermal amplification
RT-PCR – reverse transcription polymerase chain reaction
SARS – severe acute respiratory syndrome
SARS-CoV-2 – Severe Acute Respiratory Syndrome Corona Virus-2
TTA – tracheal aspirate
WHO – World Health Organization

INTRODUCTION

The first cases of a new disease were described between December 18 and 29 of 2019 in the region of Wuhan in the Chinese province Hubei. At this time there were 5 hospitalized patients with ARDS, or acute respiratory distress syndrome in the course of interstitial pneumonia caused by a new, unheard of pathogen. Until January 2, 2020 there were reports of 41 cases of a similar clinical course which were not caused by any other pathogen. The initial suspicion was an epidemiologic connection with "Wuhan's South China Seafood City Market", however due to the sudden course of disease, with time more probable became the hypothesis of healthcare associated infection which occurred in an unknown mechanism [1, 2, 3]. The team sent by the Chinese Center for Disease Control and Prevention excluded an infection with SARS or MERS virus as well as an outbreak of avian and human influenza. Due to the growing number of affected people, an attempt was undertaken to search for the etiological cause using the Next-Generation Sequencing method. On January 7, 2020 genetic material of the new coronavirus was successfully isolated and sequenced (Severe Acute Respiratory Syndrome Corona Virus-2, i.e. SARS-CoV-2) as a result of research on the specimen acquired from bronchopulmonary lavage material, and on January 12 these information were made available to the World Health Organization (WHO) [4]. Over the next weeks, there was a rapid growth of the number of cases and an increasing percentage of patients with a severe course of infection. On January 22, 2020 there were 571 patients in 25 Chinese provinces diagnosed with the infection caused by the new coronavirus, and in the next 3 days this number increased to 1975 cases. As of the end of January 2020, in China the number of confirmed cases of infection with the new coronavirus was 7734 cases. Symptoms of the infection caused by SARS-CoV-2 were also confirmed in 90 patients in other countries of Asia, Europe and North America (including Taiwan, Thailand, Vietnam, Malaysia, Nepal, Sri Lanka, Cambodia, Japan, South Korea, India, the United States, Canada, Finland, France, Germany) [3]. March 3 was the day of the first diagnosed case of Covid-19 in Poland [5]. On March 28 of the current year there were already over 650 thousand people infected with SARS-CoV-2 in the world. On that day there were over 60 thousand new cases and 3000 people lost their life due to the disease [5]. On March 28, Poland saw the diagnosis of approx. 250 new cases with over 1600 of patients since the beginning of the epidemy. Despite the multidirectional actions undertaken in the realm of politics, health care, limitation of direct interpersonal contacts to a minimum, the pandemic covered the entire world and the number of cases continues to grow exponentially. This testifies to the great gravity of the situation, and doctors and other healthcare specialists are and will remain at the front line of the battle with the pandemic, while being the group most at risk of infection. The current and continuously updated knowledge about this disease will allow to make adequate decisions in relation to patients, as well as sufficiently secure oneself and the cooperating medical staff. The authors present the most relevant epidemiologic and clinical data on Covid-19, particularly appropriate for otolaryngologists and dentists.

VIRUS CHARACTERISTICS

SARS-CoV-2 coronavirus was identified last year. It belongs to the Nidovirales order, family Coronaviridae, subfamily (groups) Orthocoronavirinae [2]. Depending on the serotype and genotype, coronaviruses can be divided into four types: α, β, γ, δ [6]. The trophicity and pathogenicity of the virus depend on the group to which it belongs; coronaviruses α most often cause mild infections of the upper respiratory tract, while β are highly pathogenic and can result in pneumonia and severe respiratory disorders (severe acute respiratory syndrome – SARS, Middle Eastern respiratory distress syndrome – MERS). Coronaviruses β are responsible for two previous outbreaks of mass human respiratory tract infections at the turn of 2002 and 2003 in China (SARS) and in 2013 in Saudi Arabia (MERS) [7, 8]. The virus identified last year in China resembles viruses causing SARS (similarity in 45–90%) and MERS (in 20–60%). It leads to infections of the respiratory tract similar to SARS, hence the name SARS-CoV-2. Comparative studies have shown a greater genetic similarity to the genome of coronaviruses found in bats (96%). Until now, it is not certain how the transfer to people took place and whether other animal species participated in this process [2].

Research shows that protein S present on the surface of the virus reacts with molecules of angiotensin converting enzyme 2 (ACE 2) in the lungs [9]. ACE 2 occurs mainly in alveolar epithelial cells (pneumocytes), predominantly type II. Binding of ACE 2 to SARS-CoV-2, like SARS-CoV, can lead to its increased expression and result in alveolar damage. The affinity of SARS-CoV-2 to ACE2 varies depending on numerous factors which could explain the differences in disease susceptibility and the severity of its course [10]. Replication of SARS-CoV-2 virus takes place in epithelial cells

of the respiratory tract and intestines, which leads to cytopathic changes and clinical manifestations from both systems.

SARS-CoV-2 coronavirus is made up of a virion about 120 nm in size, and its genome consists of a single RNA strand, which is both its genome and information RNA [2]. The virus has a two-layer coating, which consists of lipids and proteins:

- Envelope protein (E),
- Membrane protein (M),
- Protein forming ribonucleoprotein together with RNA (N),
- Spike protein responsible for binding the virus to the receptor on the host cell membrane (S).

The virus penetrated into the cell as a result of endocytosis after binding of the S protein to the host receptor. Fusion of the viral membrane with the endosomal membrane results in the release of single-stranded RNA into the cytoplasm, where the action of replicase causes synthesis of unstructured viral proteins. Virus replication occurs in the cytoplasm of host cells at 33–35 degrees C. This process results in the production of double-stranded RNA which is transcribed into genomic and informational RNA. The virus is released in the process of exocytosis after synthesis of all proteins involved in protein assembly (S, M, N, E) [11].

EPIDEMIOLOGY AND WAYS OF SPREADING

The virus spreads via droplets and through direct contact with an infected person. The presence of the virus has also been found in the blood and faces of the infected, which is why an environment contaminated with the excrements of infected people can be a reservoir of the virus [12]. However, this way of spreading needs to be confirmed and researched further [12]. Transmission of the virus to the conjunctiva is also considered a potential route of infection.

The virus incubation period is on average 6.4 days (from 2.1 to 11.1 days) [13]. According to WHO data, the time to onset of symptoms is 1 to 14 days, most often within 5 days [14]. Differences in time may result from varying transmission routes, virulence and susceptibility of the studied population. An example is the outbreak of an epidemic during the cruise of the Diamond Princess ship, where >700 of 3711 passengers were affected with Covid-19 [5]. SARS-CoV-2 has been detected in the gastric mucosa, faces, urine and saliva [19–21], hence particular care is recommended for personal hygiene to reduce the spread of the virus.

CLINICAL PICTURE AND COURSE OF DISEASE

Infection with the new coronavirus concerns patients of every age, whereby the median age of those affected is 49–59 years [15–16]. The onset of symptoms usually occurs 5 days after infection, but the incubation period may be longer in the case of scanty symptoms [14]. The most common conditions in people with SARS-CoV-2 virus infection include: fever, cough (usually dry, but some patients complain of expectoration of thick sputum), dyspnea, and feeling of general weakness and muscle pain.

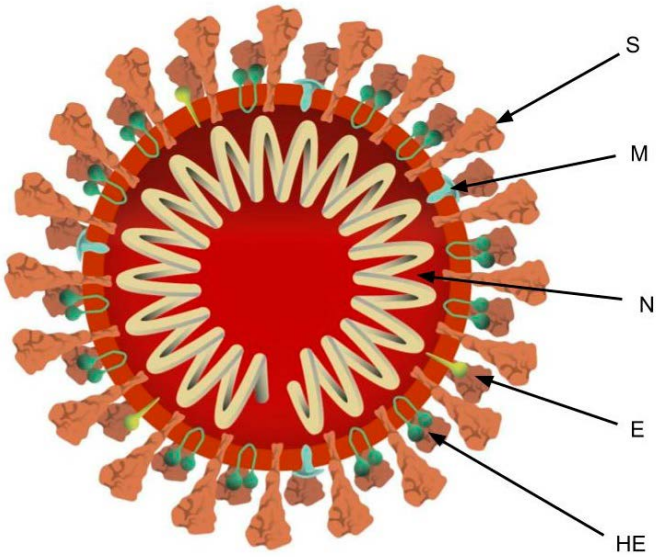

Fig. 1. Structure of SARS-CoV-2 coronavirus. E – envelope protein, M – membrane protein, N – ribonucleoprotein, S – spike protein, HE – envelope-associated hemagglutinin-esterase protein.

In the first study on a group of patients in Wuhan, the clinical picture of patients with confirmed Covid-19 revealed: fever – 98%, cough – 76%, dyspnea – 55%, muscle pain and fatigue – 44%, excessive sputum – 28%, headache – 8% hemoptysis – 5%, diarrhea – 3%. In every studied patient group, pneumonia was confirmed in each case [19]. At present, the existence of olfactory disorders in the early stages of the disease development (AAO-HNS) is emphasized, which may be helpful in earlier detection.

There are also descriptions of an atypical course of the disease, which is dominated by gastrointestinal symptoms (usually acute diarrhea), chest tightness or headache [17–18].

Relevant to otolaryngologists are reports of impaired sense of smell and taste in the course of SARS-CoV-2 infection. Postinfectious loss of smell can constitute up to 40% of all sudden smelling dysfunctions in adult patients and is inscribed in the clinical picture of infection with numerous widely encountered viruses that cause upper respiratory tract infections. In 2008, Suzuki et al. [20] identified genetic material for cold viruses in 15 out of 24 patients who reported to a doctor with a sudden postinfectious olfactory disorder. Nasal discharge collected during the patient's first visit was examined – up to 72 hours from the onset of olfactory dysfunction and after 2 weeks. Amongst the detected viruses, most were rhinoviruses, but in individual patients genetic material of the parainfluenza virus, EBV as well as a coronavirus was isolated. In the case of a patient infected with a coronavirus, the genetic material isolated during the first visit was 97% homologous with CoV 229E, but the follow up examination performed after 14 days did not reveal the presence of the virus. Analysis of acoustic rhinometry in patients during the first visit and after 4 weeks, revealed the persistence of smell disturbances after disappearance of nasal obstruction. Akerlund et al. [21] conducted a study in 1994 in which healthy volunteers were infected with CoV 229E coronavirus. The degree of olfactory impairment in the study participants correlated with nasal congestion and swelling, but

Tab. I. Clinical picture of SARS-CoV-2 infection.

THE MOST COMMON SYMPTOMS OF COVID-19:
1. fever > 38°C
2. cough
3. breathlessness
4. muscle weakness and pain
OTHER DESCRIBED SYMPTOMS:
1. chest pain
2. headache
3. diarrhea
4. smelling and taste dysfunctions

there was no significant correlation between the subjective severity of infection symptoms and the degree of smelling dysfunctions. The results of a few studies analyzing the coronavirus group in this aspect suggest that limited nasal patency is not the only mechanism responsible for postinfectious anosmia.

Reports from South Korea, China, Italy and Germany cited by the British Otolaryngologists of Otorhinolaryngologists indicate that hyposmia and anosmia concerned a substantial proportion of patients with confirmed Covid-19 infection [22]. Among patients with confirmed CoV-2 infection in Germany, 2/3 complained of a reduced sense of smell as one of the conditions. In contrast, in South Korea, where tests are performed on a large scale, 30% of patients with confirmed infection reported sudden loss of smell as the main symptom in the absence of other severe symptoms typical of Covid-19.

In view of recent reports, the American Academy of Otolaryngology – Head and Neck Surgery (AAO-HNS) has proposed to include anosmia and hyposmia to the characteristic symptoms of infection with the new coronavirus [23].

Typical changes have also been identified in other studies in Covid-19 patients. Huang et al. found features of pneumonia in CT in all patients [19]. In additional blood tests they found the level of WBC ≤ 10 × 109/L in 70% of patients and in other designators lymphocytopenia – 63%, ALT > 40 U/L – 37%, Cr > 133 mmol/L – 10%, LDH > 243 U/L – 73% Troponin I > 28 pg/ml 12% procalcitonin < 0.1 ng/ml 69%. Acute respiratory distress syndrome, or ARDS was developed by 29% of patients.

Lippi and Plebani [24] found in patients with confirmed Covid-19: leukocytosis, neutrophilia, lymphopenia, reduced albumin, elevated LDH, ALT, AST, bilirubin, creatinine, troponin, D-dimer, procalcitonin, CRP and prolonged prothrombin time. Autorzy ci uważają, że w początkowym etapie choroby może wystąpić leukopenia z limfopenią infekcji. Later, leukocytosis is found in 25–30% of patients. There is also increased activity of transaminases (ALT and AST), creatine phosphokinase (CPK) and lactate dehydrogenase (LDH), in addition increased levels of myoglobin and sometimes troponin. Most patients had elevated levels of C-reactive protein (CRP) and procalcitonin. Elevated levels of D-dimers and creatinine, leukocytosis with agranulocytosis and elevated lactate levels are observed in severe infections and are associated with poor prognosis. Patients with severe infections treated in intensive care units have high levels of cytokines (IL-2, IL-7, IL-10, GSCF, IP10, MCP1, MIP1a and TNF-α). Such deviations do not occur in patients with a mild course of infection [19].

Radiological imaging by means of computed tomography of the chest is essential for diagnosis and evaluation of the course of disease. Similarly to SARS, the detected changes are typical of severe respiratory infections and are bilateral. In the early phase, the most common radiological features are patchy milky-glass changes (clouded glass) and interstitial changes. As the disease progresses, the opacification becomes more regular (round) and infiltrative lesions occur. In the most severe cases, there is a very characteristic picture of consolidation lesions without pleural effusion [19].

In approx. 80% of cases, SARS CoV-2 infection occurs in the form of a mild to moderate respiratory infection. This group of patients does not require specialist treatment or hospitalization. However, it should be remembered that oligosymptomatic people may be a source of infection, which is why WHO recommends testing for new coronavirus infection also in patients with an incomplete clinical picture. In the absence of a possibility to perform testing on such a large scale, people with any signs of infection should undergo self-isolation [14].

Groups particularly at risk of severe Covid-19 infection are primarily elderly patients and those suffering from chronic diseases. Loads that significantly increase the risk of a severe course of infection and affect long-term outcomes primarily include: cardiovascular diseases (including hypertension, ischemic heart disease), diabetes, chronic lung diseases (COPD, asthma), recent organ transplant and other cases of necessity of using immunosuppressant drugs [15–17]. These patient groups have a particularly high risk of developing bilateral interstitial pneumonia and acute respiratory distress syndrome. Smoking is also considered to be conducive to SARS-CoV-2 infection [15–17].

The general mortality rate for SARS-CoV-2 coronavirus infection varies from 1 to 10% in different countries, while WHO currently estimates a mortality rate of 3–4% [5, 19]. Statistical records are kept on the basis of the ratio of the reported number of deaths in the course of infection to the total number of confirmed cases. Actual data may vary considerably from current data due to limited access to the performed tests and an unclassified group of mild and asymptomatic infections.

DIAGNOSIS

The principles for diagnostics are subject to certain changes depending on knowledge of the course of disease, evolving experience, epidemiological situation and legal regulations. The first step in diagnosing SARS-CoV-2 infection is a positive epidemiological history. Deng et al. [9] defined the risk factors for infection into two groups – A and B. The authors defined suspicious cases upon the occurrence of any of the factors in group A and at least two symptoms of group B or three or more symptoms of

group B [9]. Factors from group A (epidemiological) - within two weeks before the onset of symptoms were:

- history of travel or stay in a place with a confirmed case of Covid-19,
- contact with a patient with Covid-19 (confirmed by RT-PCR),
- contact with someone from the SARS-CoV-2 area who has a fever and presents signs of infection,
- confirmed cases of Covid-19 in the immediate vicinity (family, colleagues, neighbors). Group B factors (clinical signs) included:
- fever and/or other respiratory symptoms,
- confirmed pneumonia with characteristic radiological features,
- at an early stage of the disease – normal/reduced leukocyte counts or lymphopenia.

The current recommendations for suspected SARS-CoV-2 infection in Poland are as follows [25]:

1. Acute respiratory infection with a sudden onset and at least one of the symptoms: fever, cough, breathlessness or detection of antibodies in a serological test;

2. history of travel or stay in the last 14 days counting from the onset of disease to a country/region in which local transmission of SARS-CoV-2 infection was recorded;

3. close contact with a confirmed or probable case of Covid-19 in the last 14 days;

4. a severe condition requiring hospitalization in the absence of any other etiology that could explain the clinical picture.

Infection with SARS-CoV-2 in patients with suspected Covid-19 is confirmed by genetic tests. At the initial stage of the infection, specimens for these tests should be collected from the respiratory tract. Biological material is collected from the lower respiratory tract (tracheal aspirate [TTA] or bronchoalveolar lavage [BAL]), sputum, the nose or nasopharynx. Molecular tests such as RT-PCR (reverse transcription polymerase chain reaction), RT-LAMP (reverse transcription loop-mediated isothermal amplification), RT-iiPCR (reverse transcription-insulated isothermal polymerase chain reaction), r-RT-PCR (reverse transcription polymerase chain reaction) are based on the detection of viral genetic material. The sensitivity of genetic tests is 60% in posterior pharyngeal wall swabs, approx. 70% in nasal cavities and 80% in bronchial lavage fluid. In practice, a swab from the posterior pharyngeal wall is taken as high as possible towards the nasopharynx after lifting the palate [26].

To increase the sensitivity of the genetic test confirming Covid-19, swabs are taken twice with an interval of several days [25].

Auxiliary tests enabling mass tests in specific groups may be rapid serological tests performed "on request"; this includes IgM antibody testing. Examination for the detection of IgG or IgMLOOP/IgG antibodies may be useful for estimating the number of people who have had contact with the virus, as well as for population studies [25].

Tab. II. Drugs recommended by PTEiLCHZ in COVID-19 therapy version 27-03-2020.

DRUGS RECOMMENDED BY PTEILCHZ IN COVID-19 THERAPY VERSION 27-03-2020:
Remdesivir or **Lopinawir/ritonawir**
plus
Chloroquine or **hydroxychloroquine**
plus in patients with respiratory failure/
Tocilizumab (in people with elevated IL-6 concentration)
In addition, depending on the clinical course, consideration should be given to adding symptomatic therapy, broad-spectrum antibiotics, and oxygen therapy.

*specific recommendations and dosage depending on the clinical form of infection can be found on the PTEiLCHZ website, http://www.pteilchz.org.pl/wp-content/uploads/2020/03/Rekomendacje-PTEiLChZ-27-03-2020-pl.pdf

TREATMENT

There are currently no known etiotropic drugs with proven efficacy in clinical trials. In the pharmacotherapy of patients with a mild course of SARS-CoV-2 coronavirus infection, mainly symptomatic treatment is recommended, while in the case of respiratory and systemic symptoms, antiviral and antimalarial drugs are relevant. At present, in Poland the only substance that has been registered in adjunctive therapy for beta-coronavirus SARS-CoV-2 infection is chloroquine. Its mechanism of action in the treatment of viral infection is not fully recognized, however it is believed that by increasing the pH, it hinders the fusion of the host cell and endocytosis [27]. Perhaps of significance is also the anti-inflammatory mechanism of action which inhibits the production and release of inflammatory cytokines such as IL-6 and TNF-alpha [28]. Antiviral drugs are also used in Covid-19 pharmacotherapy and some countries also supplement treatment with azithromycin using the immunomodulatory potential of macrolide antibiotics [29]. In severe cases, it is recommended to include Tocilizumab - an anti-IL-6 monoclonal antibody [30]. In Poland, the recommended treatment includes: Remdesivir or Lopinavi ritonavir, Chloroquine or hydroxychloroquine, Tocilizumab [25].

RULES AND RECOMMENDATIONS FOR DOCTORS DURING THE COVID-19 PANDEMIC

Preliminary analyses suggest that alongside anesthesiologists, otorhinolaryngologists and dentists are particularly vulnerable to infection and have an increased risk of severe Covid-19 disease. This is probably associated with high exposure during the patient's physical examination. Research carried out by Zou et al. [31] indicates that the upper respiratory tract of patients infected with SARS-CoV-2 virus has a particularly high viral load, also in asymptomatic cases. Comparison of material from the nasal cavity and throat showed a higher concentration of the virus in the nasal mucosa. Therefore, the risk of infection is relevant in particular to endoscopic procedures.

With respect to the variable symptomatology of new coronavirus infection, as well as the reduced possibility of testing for CoV-2

infection, it is advisable to exercise extreme caution and use personal protective equipment during daily work with the patient. Current recommendations for ENT specialists in the USA recognize determining whether the patient is a carrier of SARS-CoV-2 as a priority in every case, examination or surgery on the upper respiratory tract and upper gastrointestinal tract; whereby it should be assumed that full personal protective equipment (PPE) is obligatory in the absence of tests excluding Covid-19 and the need to perform procedures (examination or surgeries) forming an aerosol from tissues and secretions from the upper respiratory tract (endoscopic surgery, tracheotomy, tonsillectomy, adenotomy, laryngeal microsurgery, procedures with the use of high-speed debrider devices, micromotors, air jet ventilation, all procedures in the mouth and nose, drainage of dental and pharyngeal abscesses). This includes:

- waterproof long-sleeved coveralls or surgical gowns,
- goggles or closed helmets,
- FFP-2 or FFP-3 masks,
- gloves (optimally nitrile),
- caps and foot protectors when using waterproof aprons.

Moreover, all medical staff should be trained in proper hand washing and personal hygiene, the use of personal protective equipment and avoidance of assemblies also in hospitals and clinics [32, 33]. After removing the gloves, it is necessary to thoroughly wash the hands with soap and water, and disinfect them [34, 35].

The number of performed operations should be limited to urgent (oncological) and sudden cases (complications, injuries). Pocedures in patients with symptoms indicating Covid-19, patients who have recently traveled or had contact with patients with Covid-19 should be postponed until the infection is definitively ruled out. According to NHS recommendations, if it is suspected by the doctor during consultation that the patient may be suffering from Covid-19, he should discontinue examining the patient in order to minimize the risk of contact with the patient's secretions and conduct an epidemiological inquiry and further diagnostic management.

In the event of emergencies, personal protective equipment, or PPE should be used. Patients should also be informed about the need for proper hand hygiene and social isolation prior to surgery [33].

Each participant in a risky diagnostic or therapeutic procedure should be provided with personal protective equipment. It is recommended to minimize the number of people staying in the operating theatre during such a procedure. In addition, in the absence of a sufficient number of masks with an FFP3 filter, ENT UK recommends that the mask be worn by the doctor who is examining the patient, while the doctor without a mask shall remain at a safe distance and keep a record of the examination [32]. FFP3 masks protect against aerosol inhalation and droplet transmission of the virus. In contrast, glasses are considered to be a more effective means of eye protection than a closed helmet, but nevertheless eye protection may not be sufficient. The aerosol may transfer into the eye through the side slits of the protective glasses and be a source of SARS-CoV-2 infection. The use of a microscope during surgery constitutes an indirect protection, but if possible, the physician should also wear protective glasses [33]. According to the guidelines of the European Rhinologic Society, local anesthetics should only be used in the form of soaked swabs, not atomizers, which limits the formation of aerosol. It is recommended to use PAPR (Powered Air Purifying Respirators) systems. Equipment used during the procedure should be disinfected with particular care using a disinfectant (e.g. such containing alcohol in a concentration above 70%) [23, 35, 36].

Otologic procedures

According to the position of the British Society of Otology, during the pandemic of Covid-19 mastoidectomy should be postponed. The exceptions are sudden: acute mastoiditis, otogenous intracranial infections with sepsis and ear and temporal bone cancers. For acute mastoiditis, recommendations include the use of instruments such as bone spoon and chisel, and restrictions on the use of high-speed micromotors. A patient prepared for surgery should maintain low blood pressure to minimize bleeding. The use of high-speed rotary tools or methods of increased air or fluid pressure is associated with the release/formation of large amounts of aerosol [37, 28, 41]. To reduce the floatation of aerosol particles, it is recommended to limit the use of such methods and to effectively evacuate aerosol and liquid with a suction pump. Procedures not considered urgent such as tympanoplasty, radical ear surgery, implantation of cochlear implants should be postponed.

Tracheostomy

According to the position of ENT UK, intubation is considered to be a lower risk procedure than tracheostomy. The procedure should be shortened in each of these operations, meaning that it should be performed by the most experienced anesthesiologist or surgeon [40]. It is recommended that the patient be tested for Covid-19 before performing tracheostomy. Tracheostomy is considered a high-risk procedure due to the fact that it leads to contact with secretions that could contain high levels of aerosol formation and virus spread. In the case of confirmation of Covid-19, if it is allowed by the patient's condition, tracheostomy should be postponed. During tracheostomy or replacement of tracheostomy tube, evacuation of fluid and discharge from the patient's airways could occur. The staff should wear appropriate personal protective equipment: mask, safety glasses, preferably with a closed helmet, apron and gloves. The surgical gown should be waterproof; in case of using a non-waterproof apron, there should be an additional foil layer under the surgical gown. The doctor should use disposable sterile gloves, and in exceptional cases it is recommended to use a double pair of gloves [32].

The use of cuffed non-fenestrated tracheostomy tubes reduces the risk of aerosol formation and transmission of virus. Breakage of continuity of the tube cuff during tracheostomy must be avoided. Before creating a tracheal window, the endotracheal tube should be inserted. If possible, ventilation should be interrupted temporarily when creating a tracheal window. Before restarting ventilation, the cuff must be checked for proper inflation, the absence of leakage from the cuff, and secure fastening of the tube. The use of high flow oxygen therapy is not recommended [32, 40].

Oral procedures

The Polish Dental Society has prepared official recommendations in the field of prevention and hygiene. History taking should be conducted in terms of overall health, as well as extended to include symptoms such as fever, cough, breathlessness, respiratory problems. The patient should be asked about travels abroad to countries with SARS-CoV-2 infections. If the patient presents clinical symptoms such as fever, cough, breathlessness, respiratory problems, the need for dental surgery should be considered. When the patient shows no symptoms and is examined on schedule, care should be taken to avoid touching the face, eyes and nose to minimize the risk of infection [42].

Before each dental procedure, the mouth should be rinsed with an antiseptic in a solution of warm water at a temperature of above 27 degrees Celsius. Rinsing the mouth with an antiseptic is intended to reduce the number of microorganisms. According to Guideline for the Diagnosis and Treatment of Novel Coronavirus Pneumonia (the 5th edition) published by the National Health Commission of the People's Republic of China, the widespread use of chlorhexidine rinses in dental offices is not effective in combating SARS-CoV-2. The virus is sensitive to oxidative agents, and rinses should contain 1% hydrogen peroxide solution or 0.2% iodine povidone. This enables reduction of the transmission of microorganisms and potential SARS CoV-19 virus [41, 43].

Staff should wash and disinfect their hands often. Flat surfaces in dental offices should also be disinfected. Personal face protections such as masks, goggles, closed helmets should be used during contact with the patient. It is recommended to conduct briefings for medical staff, including hygienists, assistants and medical registration employees in clinics and dental offices [44, 45].

CONCLUSION

The Covid-19 pandemic has completely altered the daily lives of residents, patients and doctors. Within a few weeks, awareness of epidemiological prevention in patients and doctors became widespread. Behaviors considered typical, such as shaking hands at greeting, also became a prohibited gesture with patients. Both protection of the patient as well as the doctor against infection has become not only a medical but even social issue. To apply the correct principles of preventive treatment against SARS-CoV-2 infection and new rules of medical conduct, it is necessary to constantly update the knowledge resulting from quickly acquired experience. In the aspect of the key data about Covid-19 presented, it can be stated that the clinical picture of the disease is quite typical, but not specific. Most patients develop pneumonia, which is a key location for infection. Patients suspected of infection should be isolated and the diagnosis confirmed by molecular genetic testing. About 3% of those affected will have a severe life-threatening course of disease. There is currently no specific cure. Low-symptomatic first stages of infection with high infectivity mean that during a pandemic, scheduled examinations and procedures should be canceled. There is a particularly high risk of infection for physicians dealing with the region of the upper respiratory tract and the initial section of the respiratory tract.

Management of patients with confirmed SARS-CoV-2 infection or requiring prompt treatment without the possibility of determining epidemiological factors of Covid-19 require the use of complete personal protective equipment, or PPE to reduce the risk of infection of the patient and/or treatment team.

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