Severe Acute Respiratory Syndrome (SARS) and the GDP. Part I: Epidemiology, virology, pathology and general health issues

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The health profession faces a new challenge with the emergence of a novel viral disease Severe Acute Respiratory Syndrome (SARS), a form of atypical pneumonia caused by a coronavirus termed SARS-CoV. This highly infectious disease has spread through 32 countries, infecting more than 8,400 patients with over 790 deaths in just over 6 months. Over one quarter of those infected were unsuspecting healthcare workers. The major transmission mode of SARS-coronavirus appears to be through droplet spread with other minor subsidiary modes of transmission such as close contact and fomites although airborne transmission has not been ruled out. There is as yet no definitive treatment protocol. Although the peak period of the outbreak is likely to have passed and the risk of SARS in the UK is therefore assessed to be low, the World Health Organisation has asked all countries to remain vigilant lest SARS re-emerges. Recent laboratory acquired cases of SARS reported from Taiwan and Beijing, China are a testament to this risk. Until reliable diagnostic tests, vaccine and medications are available, control of SARS outbreaks depends on close surveillance, early identification of index cases, quick isolation of carriers and effective infection control and public health measures.

INTRODUCTION

Yet another emerging disease is threatening to take a foothold on the global populace. This novel disease entity, termed Severe Acute Respiratory Syndrome (SARS), is an atypical pneumonia that is likely to have originated in the Guangdong province of Southern China in the fall of 2002.¹,² As of August 2003 more than 8,400 SARS cases and 916 deaths have been reported worldwide from 32 countries.³ The brunt of the disease has thus far been borne by the East, especially China (including Hong Kong) and Singapore whilst the West, except for Canada, remains relatively unscathed with only sporadic infections brought home by travellers to affected areas. During this period the UK had a total of four probable cases, one of which had a confirmed exposure to the SARS coronavirus. All four had fully recovered and there was no secondary spread.⁴ The World Health Organisation (WHO) has announced recently that the peak period of the outbreak is likely to have passed and the associated dwindling in the morbidity and mortality rates is a testimony to this. In countries like the UK the risk of SARS is therefore assessed to be low. However, WHO has asked all countries to remain vigilant. The Health Protection Agency (HPA) of the UK also advised that the situation in the UK may have to be re-assessed if SARS does re-emerge.⁵ And indeed a confirmed case of SARS coronavirus infection was reported in Singapore as recently as September 2003 although the infection was transmitted through laboratory contamination and not via the community.⁶

We provide in Part I of this paper a brief account of the epidemiology, virology and clinical features of SARS, the general infection control measures and public health concerns. Part II will provide a detailed account of infection control measures that may be applied in the general dental practice, especially in the SARS-affected areas.
the disease and its prevention. Hence the readers are urged to keep current by periodic referral to the websites at the Health Protection Agency of the UK (http://www.hpa.org.uk/infections/topics_az/SARS), Centres for Disease Control and Prevention, USA (http://www.cdc.gov/nccdod/sars/) and the World Health Organization (http://www.who.int/en/).

THE DISEASE AND VIROLOGY

SARS is rapidly progressive and highly infectious. Although less contagious than influenza it is much more so than other circulating viruses such as the human immunodeficiency virus. In fact SARS is the first severe and readily transmissible new disease to emerge in the twenty-first century. Most SARS infections occur after close exposure to the index case as in household contacts but casual social contact may transmit the disease on occasions.

The spread amongst front line healthcare workers (HCWs) has been one of the most disconcerting aspects of SARS. Currently, one quarter to one third infected are unsuspecting HCWs who fought to save the lives of patients without adequate barrier protection. International travel through major transportation hubs such as Hong Kong and Singapore has facilitated the spread of the disease to all corners of the globe within a short time span.

In one study RNA from the SARS-CoV was found in half of the nasopharyngeal specimens from SARS patients but in no specimens from 40 patients with other respiratory illnesses. Raising antibody titres to the virus were noted in all 32 SARS patients from whom second serum specimens were obtained. Viral RNA was found in 10 of 18 faecal samples from SARS patients. Further, a SARS-like disease has been reproduced in monkeys through inoculation of the SARS-CoV. Thus all of Koch's postulates (see Box 2) have been fulfilled with regard to the viral aetiology of SARS. Finally, and remarkably, within a short period of 3 months, the entire viral genome has been sequenced and is freely available for scientific use through the worldwide web.

MODE OF TRANSMISSION

The major transmission mode of SARS-CoV appears to be through droplet spread with other minor subsidiary modes of transmission such as close contact, fomite transmission (eg faeces) of possible or probable cases of SARS (see later), while that case was symptomatic.

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SIGNs AND SYMPTOMS

There is an incubation period of usually 2–10 days. The first symptoms are fever (>38°C) in 100% of patients and malaise (in 70%) followed by non-productive cough (in nearly 100%) and dyspnoea (in 80%). Chills, rigors, headache, malaise, diarrhoea and myalgia are common whilst rhinorhoea and sore throats are uncommon (in fewer than 25%).

Radiological signs may be seen at the onset of fever and chest radiographs reveal consolidation that progressively increases in size, predominantly in the lower lung fields; pleural effusions are absent. Lung biopsy reveals interstitial inflammation. Oxygen saturation is reduced in some one half of patients. Laboratory testing reveals leuкоopenia, lymphocytopenia and thrombocytopenia.

DIAGNOSIS AND TREATMENT

Specialist laboratories eg the Health Protection Agency (HPA) National Influenza Reference Laboratory at Colindale perform diagnostic tests which detect the virus (cell culture and reverse transcriptase polymerase chain reaction, RT-PCR) or antibody (immuno fluorescent antibody assays) [see Box 3 for diagnostic test definitions]. However, the duration of detectable viraemia or viral shedding is unknown, leading to false negative results when samples are not taken at the right time. Moreover, the collection of nasopharyngeal aspirate (the specimen of choice) induces reflex actions from the patients that generate aerosols, that exposes the attending HCW to a high risk of infection.

Paired serology, ie seroconversion, obtained on day 1 and > 21 days after onset
is 13%.25

over 65 years; The median fatality rate years of age to more than 50% in persons associated with worse prognosis. Fatality rate od of first 8 days of symptom onset is asso-
delay in treatment beyond a window peri-
been resolved as yet. According to some,
and steroids, the efficacy of which has not
uncontrolled trials of antiviral (ribavirin)
Box 3 Definitions of RT-PCR, ELISA test and IFA

RT-PCR (reverse transcriptase-polymerase chain reaction)
It is a technique used to amplify RNA targets. This technique is sensitive enough to enable
detection of RNA from a single cell.

ELISA test (enzyme linked immunosorbent assay)
Antibodies (to a specific antigen) are coupled
with an enzyme. When that specific antigen is present and bound to the enzyme-coupled
Antibodies, a colour product is formed and readily detected.

IFA (immuno fluorescent antibody)
It is a technique used to detect serum antibodies and immune complexes. The antigen-antibody
complex is labelled with a fluorescent-conjugated antibody and becomes detectable.

of symptoms, is considered by WHO and HPA to be the diagnostic gold standard20 but it is only useful for confirmation of the diagnosis (or exclusion of the diagnosis if negative) and not for screening purposes. Diagnosis is thus based on clinical find-
ings, epidemiology and exclusion from other pneumonias and is confirmed by a
positive seroconversion.21,22 There is no
definitive treatment and empirical regimes differ amongst countries and may include
the use of antibiotics, anti-virals and
steroids.1,23,24 Severe cases require
mechanical ventilation in intensive care units.1,7 Several groups have reported
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CONCLUSION

The newly emerged SARS-CoV caused significant morbidity and mortality in a relatively short period of time especially in the Asian region. Researchers worldwide are striving hard to unravel the mystery of its virology including the reservoirs of infection, pathology, modes of spread and finally an effective vaccine. A definitive screening and treatment protocol for the infection is yet to be determined. Until then the public healthcare workers including the dental professional must rely on preventive measures, particularly screening and astute infection control in the event of its possible re-emergence.

The implications of SARS for the general dental practitioners will be discussed in the second part of this paper.

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