

Comparative Evaluation of Effectiveness of Different Face Shields While Treating Dental Patients during Pandemic 2020

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Abstract

Purpose: Assess the level of protection provided by the various face shields on the aerosol, assess their fogging ability and handling while working.

Materials Required: Airtor, cavity preparation burs, phantom head, typodont model (api), studs face shields, steel bird protective face shield, OHP face shield, Vega Kavach 3 face shield and fluorescent dye.

Method: Forty typodont mandibular first molar teeth were selected and divided into 4 groups (n = 10). A fluorine dye has been added to water reserve fixed to the typodont unit. Cavity preparation was then performed by a single operator's using four separate face shields. The filter paper was glued to the operators face, ears, chin and shoulders.

Results: The amount of aerosol produced, fogging and the effect of the weight of the various face shields on the operator's ergonomics were evaluated. The OHP face shield exhibited maximum aerosol exposure in comparison with other group. The haze was lesser for steel bird and Vega Kavach face protector. However, in terms of weight OHP facial screens were the easiest to use.

Keywords: Faceshield; Aerosol Contamination in Dentistry; COVID; PPE; Fogging; Dental Unit Water Line; Infection Control; Cavity Preparation

Introduction

The World Health Organisation (WHO) reported a new outbreak of coronavirus on March 11, 2020. This devastating illness has affected every sector, disease has impacted every sector, with dentistry being the one of the most affected occupations. This is due to the direct generation of aerosols during different treatment modalities (e.g. cavity preparation, scaling) as WHO has previously stated that air borne transmission and direct contact with affected patients are the most potent factors for acquiring the infection.

In order to fight the risk of contracting the infection, the use of various equipment's by dentists as protective equipment showed a resurgence. Personal protection in this pandemic is the current

need, particularly for dentistry professionals. It is designed to preserve health and reduce exposure to a minimum. If the right protective protocol is not upheld, transmission will be unavoidable. These equipment's include PPE, face shields, different types of face masks, protective eye wear, head caps and shoe cover, among others.

At this crucial time, face shields have emerged as a savior to protect health care workers from aerosol transmission. It has been demonstrated that face shields reduce exposure by 96% when worn by a health care worker to less than 18 inches of cough patients. Even after 30 minutes the protective effect exceeds 80% and blocks 68% of the small particle aerosols for optimum protection, face shields must completely cover the face at the front and side without any space between the forehead and the head of the screen.

Despite the availability of various face shields, people are still skeptical in the performance of dental treatments, because of the fear of aerosol transmission of disease. Therefore, in our study we analyze the effectiveness of various face shields available in the marketplace to minimize the risk of aerosol generation during routine dental procedures. As part of this study, we used commonly available face shields: Studs face shield (Chesa Co Ltd), protective face shield (Steelbird), OHP face shield and Vega kavach 3 face shields.

Figure 1: Complete set picture.

Materials Required

Airotor, cavity preparation burs, typodont model, Studs face shield, OHP face shield, protective face shield Steelbird, Vega kavach 3 face shield, fluorescent dye.

Methodology

A total of 40 mandibular right first molar typodont teeth were taken for this study. They were further divided into four equal groups with 10 samples per group.

All four groups were:

1. First group: Studs face shield.
2. Second group: OHP sheath face shield.
3. Third group: Steel bird protective face shield.
4. Fourth group: Vega kavach face shield.

Of those, group FOUR was kept as a control group.

The typodont was attached to the jaw of phantom head. The dental chair, having phantom head, was set in reclining position simulating the dental operatory. The operator chair position was at

11 o' clock. Fluorescein has been added into the dental chair water tank. Filter paper was affixed to the forehead, both ears, shoulders. Mock cavity preparation was then done for 15 minutes with a high speed and low torque Airotor, with simultaneous use of conventional low volume saliva ejector.

Figure 2: Four different faceshields.

Figure 3: Attached filter paper on forehead, ears, shoulders and chin.

The amount of protection provided by the four different aerosol shields was assessed by scattering fluorescent dye onto the filter papers. The front surface of the face shield was checked for fog during work. Furthermore, the manoeuvrability of the face shield was assessed according to the operators level of comfort during work.

Results

Of the four groups, maximum protection against aerosol contamination was obtained with a steel bird protective face shield, followed by Studds face shield and the Vega KAVACH 3 face shield. The OHP face shield offered the least protection against aerosol.

Vega and Steelbird protective face shields produce the lowest amount of fog while, Studds face shields produce the highest amount of fog. Whereas there was no fog generation in OHP face shield.

The Studds, Vega face shield and Steelbird protective face shield completely covered the face, providing better protection than the OHP face shield. On the contrary, OHP are easy to carry as compared to Steelbird and Studds face shield.

Figure 4: Fogging ability of different face shields.

Discussion

Aerosols are liquid or solid particles with a diameter less than or equal to 50 mm and remain suspended in the air for an extended period of time. They can penetrate deeply into the respiratory system, reaching as far as pulmonary region. Aerosol production during routine dental procedures include saliva, nasal and throat secretions, blood and materials used for dental therapy. These aerosols can play a major role in covid transmission and can be reduced by using micromotor instead of Airotor. Using Airotor with

diminished water flow, avoiding the use of three-way air syringe, cotton to dry the area are the few other ways to limit the transmission.

But despite of all these measures, we still need special protection from these contaminated aerosols. This pandemic has once again highlighted the need to combat infection. Personal protective equipment is a specialized equipment worn by an employee to protect themselves from infectious substances (OSHA).

Face shields in conjugation with protective eye wear, face mask, head cap etc., and complements the PPE. There are variety of protective face shields available on the market, but their effectiveness against aerosols is still unknown. Therefore, the study was carried out on the typodont model in order to compare the level of protection provided by different face shields during the treatment of a patient. This study employed the Studds face shield, the Overhead Projector face shields, Steelbird face shield and Vega kavach 3 face shields.

The OHP face shields used in this study were 3.2 mm in diameter with a length of 44 cm. They only covered the face from ahead. They can be easily cleaned with 1% sodium hypochlorite for 10 minutes, 2% glutaraldehyde for 10 minutes sanitizers or UV ray sterilization.

Studds face shield (Chesa co. (ltd) are 190 mm in height x 260 mm in width, and 2.2 mm thick. They fully cover the face and adapt well with the contour of the face providing better protection from the aerosol. They come in both types d1 and t1. We used d1 in our research as they fit perfectly with facial anatomy. The face shield weighs around 195 grams so, they are not affected by the environment. They can be worn with safety glasses and can be disinfected easily with alcohol or sanitizers. The benefits of these face shields are numerous. They are easy to carry, less foggy than OHP and reusable. They have an adjustable strap that assists the operator in adjusting them according to the anatomy of the face. In addition, they have a cushion attached close to the area of forehead which is comfortable for the operator and there is no laceration. The major disadvantage of using these face shields is that they become foggy within 2 - 3 minutes of work.

Protective face shields (Steelbird co ltd) are long face shields mainly manufactured for health care workers to combat the coronavirus that is currently spreading at an alarming rate. They measure 20 x 38 cm in length and width and 2 mm in thickness They

are made up of shatterproof polycarbonate shield which gives them a longer shelf life. They have a foam for comfort and are covered with soft fabric and adjustable size belts. The benefits of steel protection face shields on Studds face shields are anti scratch, anti-fog, true optical, and UV printing coating, so they can be easily sterilized as mentioned by the manufacturer's guidelines. In addition, they are much less susceptible to aerosol. The only downside of this face shield is that it is slightly heavier in weight (830 grams) than the others.

VEGA has introduced an innovative face shield called KAVACH. They come in 3 variants 1, 2 and 3. In this study we used the third variety which is a reusable high impact polycarbonate material which offers great impact resistance and high optical clarity. Kavach is an injection moulded face shield that offers comprehensive protection against splashes, sparks, chips and debris. They are coated with a hard Lacquer coat which protects them against scratches and UV light. They weight approximately 193 grams. The face is consists of a polycarbonate screen, two rubbers for comfort, and an adjustment for the head, an adjustable locking system, a movable visor and an adjustable strap. The advantages of these face shields are that they offer good visual effect with anti-fogging vision. They have a mobile visor that gives the operator the benefit of not removing them after each patient and can be adjusted. They are easy to wash with soap water and can be sterilized by 50% alcohol-based sanitizer.

These protective face shields provide an added layer of protection on face and eyes for a longer time without much discomfort. These observations support the need of using face shield barrier during these testing times. An extra step towards protection can do no harm, both to the patient and the operator.

OHP- These were the most economical, lighter in weight and adapted well with the facial contour. These face shields also had a number of shortcomings, namely, the face shields are very long and almost touch the PPE of the operator. Secondly, they drift away from the face due to air. Thirdly, they lacerate the forehead tissue. All these factors result in less protection from the aerosols generated while working [1-4].

Conclusion

Our study demonstrated the qualitative assessment of aerosol contamination during cavity preparation. However, air quality assessment could not be included on a simulated model of the dental operatory. It was also assumed in our study that the aerosol is uniformly distributed in the air; hence, only a particular area of the dental operatory was assessed as sample for estimation of

contamination. The risk of dental aerosol can be minimized by following simple and inexpensive equipment's. There are various face shields available in the market for health care workers to fight from this crisis gripping the country. From this study we can conclude that protective face shield (Steelbird co ltd) and Vega Kavach face shields are better than the other face shields as they effectively provide protection from the aerosol.

Conflict of Interest

There is no conflict of interest.

Bibliography

1. Global research on corona virus disease (covid-19) world health organization (2020).
2. Richard Holliday, *et al.* "Evaluating contaminated dental aerosol and splatter in an open plan clinic environment: implications for covid 19 pandemic". *Journal of Dentistry* 5 (2021): 103565.
3. Splatter and aerosols contamination in dental aerosol generating procedures". *Applied Sciences* 11 (2021): 1914.
4. Google scholar.

Bibliography

1. Global research on corona virus disease (covid-19) world health organization (2020).
2. Richard Holliday, *et al.* "Evaluating contaminated dental aerosol and splatter in an open plan clinic environment: implications for covid 19 pandemic". *Journal of Dentistry* 5 (2021): 103565.
3. Splatter and aerosols contamination in dental aerosol generating procedures". *Applied Sciences* 11 (2021): 1914.
4. Google scholar.

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