

Chapter

Early Management of Dental Trauma in the Era of COVID-19

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Abstract

Traumatic dental injuries are emergencies that must be treated promptly and properly to reduce the suffering, costs, and time for patients and parents. However, since the coronavirus disease 2019 (COVID-19) outbreak was declared a pandemic on March 11, 2020, most dental care facilities in the affected countries have been completely closed or have been only providing emergency treatment. This can partly be a result of the lack of universal protocol or guidelines regulating the dental care provision during such a pandemic, especially in the management of dental trauma. This lack of guidelines has the potential to both promote the spread of nosocomial COVID-19 through oral health care facilities and deny people in need of immediate treatment. Moreover, ceasing dental care provision during such a period will incense the burden on hospitals' emergency departments that are already struggling with the pandemic. Therefore, this chapter elaborates on the importance of early management of dental trauma by sharing local guidelines and experience with a proposed algorithm for the early management of dental trauma during the emergence of COVID-19.

Keywords: management, dental trauma, COVID-19

1. Introduction

Even before the pandemic, dental trauma is one of the world's leading oral health problems that is often neglected [1] leading to a global burden of disease amounting to a US\$2—5 million per 1 million inhabitants annually [2]. When the world was hit with a deadly coronavirus in late 2019, the whole world is in a massive total economic and social lockdown to focus on controlling the spread of the infection. The impact it had on the health services is detrimental enough to negatively affect not only the treatment and monitoring of dental trauma patients but also intensify the challenges in new findings and further scientific contributions to dentistry [3, 4].

Before coronavirus disease 2019 (COVID-19), the reported prevalence of dental trauma had varied widely as they depend on various factors such as age, etiology, region, environment, and gender. These injuries may be caused by road traffic accidents, bicycle accidents, assaults, falls, sports, industrial accidents, as well as

iatrogenic causes from intraoral procedures. The prevalence of dental trauma in overall groups of patients were ranging from 15% to 30% [2] with an incidence rate of roughly 1—3 per 100 person-years [5, 6]. It was thought that approximately 900 million people had at least one dental trauma in the year 2016 with 1 in 4 adults and one in 6 adolescents having had a history of traumatic dental injuries [1]. The types of dental trauma reported include orofacial soft tissue injuries, maxillomandibular injuries, as well as traumatic dental injuries, in which the majority of the cases were contributed by traumatic dental injuries.

2. Dental trauma and COVID-19: the incidence

The pattern of dental trauma affecting different age groups has been relatively constant for the past many years, with the majority of the cases being contributed by pediatric patients. It was reported that 25% of the dental trauma was affecting the primary dentition, whereas 33% of the dental trauma was found in permanent dentition with the majority of the injuries occurring before the age 1 of 9 [2, 7]. Different age groups were known to have different etiologic factors leading to the presentation of dental trauma. A most common cause of dental trauma in preschool children is due to accidental falls, whereas in school-age children ranging from 7 to 12 years, sports and school fights were the main etiologic factors [2]. Assaults and road traffic accidents are more common etiologic factors among adolescents and adults [6]. This characteristic pattern of etiological factors is significantly affected when the world is hit by the COVID-19 pandemic. Due to the restricted movement order by most government authorities in the world, the changes in the epidemiology of dental trauma were very challenging to acquire for many reasons including the limited oral health emergency services available, as well as the restrictions in the data collection for the epidemiological studies.

Because of the COVID-19 pandemic, school closures, travel restrictions, and cessation of social events have changed the character of dental injuries. It significantly reduced the reported cases of dental trauma during the pandemic period. Few studies done were done in China, India, the UK, and Europe had described a significant reduction in the presentation of dental trauma in the primary and emergency dental services when they compared the dental attendances during a similar period before COVID-19 [8–10]. Some studies in China and the UK even showed that during the pandemic, there was a relatively higher case of dental trauma among preschoolers aged below 6 years, followed by adults [4, 8]. This pattern was different before covid-19 where the majority of the dental trauma cases were contributed by the adults. However, in Europe, it was found that most of the dental trauma was from the adults, with the age group of 20—29 years contributing to more than half of the adult patients [9, 10].

The global lockdown had led to a reduction in road traffic, social violence, group sports, and other school activities. This led to a reduction of dental trauma cases contributed by the mentioned activities. Nonetheless, reports on dental trauma during the pandemic showed that there was a significant increase in accidental falls and bicycle accidents leading to the dental and maxillofacial trauma ranging from 52% to 68% of presentations [8, 9, 11, 12]. This is further followed by interpersonal violence, occupational accidents, and road traffic accidents. A report in the UK also found that assaults from interpersonal and domestic violence had also increased considerably during the pandemic lockdown amounting to approximately 6% compared to a 2.6%

prevalence before the pandemic [8]. It is no doubt that the socioeconomic gap that is present in some societies may have contributed to more interpersonal violence when the authority employed the social distancing measure and enforced the “stay-at-home” guidance to flatten the infection curve [13].

Dental trauma can present as an isolated injury or in association with a multisystem traumatic injury. The trend of cases seen in the emergency setting since the COVID-19 emerged has also drastically transformed from a higher number of polytrauma seen in road traffic accidents to a more isolated injury. Soft-tissue facial injuries and traumatic dental injuries caused by the accidental falls were prominent in comparison to maxillo-mandibular fractures [9, 12]. Since children aged below 6 are those mainly contributing to the number of cases during COVID-19, the diagnosis of traumatic dental injuries was reported to be mainly dentoalveolar injuries which include concussion, luxation, and intrusion injuries to the anterior teeth that may range from 20% to 28% [8, 12]. However, in young adults with permanent dentition, the type of dental trauma presented during the pandemic was reported to be tooth fracture which mainly includes complicated crown fractures ranging from 62% to 75% [8, 9]. Depending on the impact of force from trauma caused by accidental falls or assaults, direct injury mechanisms can contribute to soft tissue injuries usually presenting with a laceration of the lip or chin [14].

The accidental falls with the chin falling first contributed to the indirect forces on the mandibular teeth against the maxillary dentition. The impact of this force often results in complicated crown fractures. The upper central incisors were reported to be most frequently injured [8] regardless of permanent or primary dentition. This trauma is usually accompanied by a condylar and/or mandibular symphysis fracture and intraoral soft tissue and submental laceration. Alveolar fractures were the least number of cases presented during the pandemic phase.

Throughout this unfortunate pandemic phase that had claimed millions of lives, a conclusion can be drawn to the pattern of dental trauma epidemiology which was highly influenced by the social and economic factors. The presentation of dental trauma in the emergency dental services during the COVID-19 pandemic was more likely to be caused by the lower energy injuries caused by falls and assaults that were more likely to be sustained in the home due to the restricted movement and quarantine orders governed by the authorities. Soft-tissue facial injuries accompanied by isolated traumatic dental injuries to the anterior dentition predominated the epidemiology of dental trauma during the COVID-19 pandemic. There is a significant reduction during the pandemic in the more complex dental trauma caused by the high kinetic injuries that would occur outside the homes, such as road traffic accidents and sports injuries.

3. Early management of dental trauma

Initial management when dental trauma occurs on the day of injury has a great influence on healing and the prognosis of the affected teeth. Correct diagnosis and a well-timed treatment will improve outcomes when managing dental trauma, especially in children and adolescents due to growth spurt consideration. Timeliness of treatment provided is a crucial indicator to salvaging the tooth provided an appropriate assessment is conducted and treatment is done according to recommended established guidelines [15–17].

3.1 Dental trauma emergencies

Avulsion, luxation, displaced root fractures, and alveolar fractures require immediate dental treatment. Avulsion of permanent teeth requires timely management, particularly in the first 15 minutes after the traumatic injury [16]. Immediate tooth replantation is strongly advised, however, if this is not possible, the avulsed tooth should be placed in a medium able to preserve the periodontal ligament.

Complicated crown-root fractures (fractures with pulp exposure) should be treated within 24 hours [15]. If tooth fragments are available, they can be reattached once conservative pulp therapy has been completed. However, it is recommended to immerse it in distilled water or saline for 30 minutes before reattachment for rehydration. This process will increase its bonding strength particularly if the fragment is kept dry for long period.

Uncomplicated crown fractures, subluxation, and tooth concussions are not classified as dental emergencies. However, all exposed dentine should be covered promptly within 24 hours, as the patient will experience discomfort due to the sensitivity of exposed dentine. It is crucial to prevent bacterial penetration into the dentinal tubules, thus affecting its long-term prognosis.

Soft tissue injuries also need priority care, and appropriate referral should be made according to the severity of the soft tissue injuries especially in deep through and through lesions and when it involves anatomical aesthetic consideration.

3.2 Assessment checklist

A checklist is recommended to ensure that detailed information regarding the patient and injury is obtained, including [18]:

1. Patient's name, age, gender, address, and contact numbers (including body weight for young patients)
2. Central nervous system symptoms exhibited after the injury e.g., nausea, vomiting, amnesia, double vision, seizures
3. Patient's general health status
4. Details of the injury occurred e.g., when where, and how
5. Treatment the patient received elsewhere
6. History of previous dental injuries
7. Disturbances in the bite
8. Tooth reactions to thermal changes or sensitivity to sweet and sour
9. If the affected teeth are tender to the touch or pain elicited during eating
10. If the patient is experiencing associated pain in the adjacent teeth, jaw, or temporomandibular joint area

The injury must always be thoroughly assessed by both extraoral and intra-oral clinical examination and radiographic investigation. The current American Association of Endodontists (AAE) guidelines recommend taking one occlusal and two periapical radiographs with different lateral angulations for all dental injuries, including crown fractures. If cone-beam computed tomography is available, it should be considered for more serious injuries, such as crown/root, root, and alveolar fractures, as well as all luxation injuries.

Additionally, sensitivity tests should be conducted on all teeth involved, including opposing teeth. Cold testing is recommended over electric pulp testing in young patients. Both testing methods should be considered, however, especially when there is no response to one of the two. The pulp might be nonresponsive for several weeks after a traumatic injury, so a pulp test should be done at every follow-up appointment until a normal response is obtained.

3.3 Clinical management

Dental trauma can be categorized into two groups: fractures and luxation injuries. Fractures are further divided by type: crown, crown-root, and root fractures. Any dental tissue injuries that lead to pulp exposure, is considered a complicated fracture. However, if the pulp is not exposed to the oral environment, it is an uncomplicated fracture.

Tetanus prophylaxis administration should be considered for contaminated wounds even though the patient may have had previous immunization history. Broad-spectrum antibiotics against gram-positive organisms such as penicillin, and cephalosporin, are the drugs of choice for soft tissue injuries with oral cavity communication.

4. Barriers to early management of dental trauma during COVID-19

Traumatic dental injury (TDI) can occur even via a low-kinetic trauma which can happen anywhere relating to falls, sports, and collisions with objects and people. Hence, it is the most common type of dental-related trauma to occur. TDI is also a condition that requires urgent attention, being more so since its management can be more daunting if the case involves young patients with primary dentition or mixed dentition stage [19]. This form of trauma despite not being life-threatening in most cases can cause significant distress to the patient as well as their parents as there are substantial physical, aesthetical, and psychological consequences. In the urgent setting, dental trauma care revolves around the tenet that it is intended to stop the pain, and restore oral function and esthetics whilst reducing dental anxiety [20]. In the long-term setting, the treatment should avoid infection propagation and smooth progression of growth to permanent dentition if the situation involves young children group.

The proper steps of management are essential to mitigate the undesired short- and long-term consequences [21]. Even in cases of properly reviewed young patients with a history of severe dental trauma during the deciduous or mixed dentition stage may present with consequences years later leading to issues with permanent dentition succession problems [22, 23]. Despite clear guidelines being spelled out for the management of TDI; COVID-19 concern takes precedence which indicates that the usual standard of care may not be the feasible option. In a situation, with the COVID-19 pandemic still being rampant amongst the population, many barricades impact the

ideal provision or acquisition of care for dental trauma. These barriers are represented at many points including dental healthcare regulation policy, patients' concerns, dental service providers' concerns, dental amenities issues as well as other limitations.

Some studies have reported that patients are more than hesitant to obtain dental care due to fear of COVID-19 transmission [9, 24]. This concern is very much allayed by the fact that most dental treatment revolves around the implementation of aerosol-generating procedures (AGP). Hence the risk of transmission is increased [25, 26]. During dental AGP several thousand droplets are aerosolized where larger droplets gravitate quickly to surfaces whilst smaller droplets tend to evaporate allowing dry microscopic pathogens to remain air-borne and freely circulating via air convection [26]. The basic understanding of COVID-19 in terms of its novel and rapid transmission instills this dread even more amongst the public [4]. A study done in Nigeria by Ajayi and Arigbede [27] implies that patients choose to defer from seeking treatment for dental-related emergencies as it is their perception that such ailments are not life-threatening, hence it would simply resolve them on their own. Ahmad et al. [28] also communicated that patients' refusal for seeking urgent dental treatment includes dental fear, perception of need, sterilization concerns, lack of awareness, and discomfort at the long wait in the emergency or dental outpatient clinic. This is due to the notion that the emergency waiting area could be harboring active COVID-19 patients. Hence, this cavalier approach of wait and see by the patient towards dental trauma is not just limited to the population with limited access to health care provisions.

Additionally, many do believe in the notion that if there are no symptoms or if the symptoms resolve, no further treatment is necessary after the dental trauma. In some other situations, it is the patient's concern about the high treatment cost incurred upon seeking dental trauma treatment, especially since COVID-19 has diminished livelihood and devastated job opportunities. Another report suggests that the reluctance of patients even in developed nations to seek treatment for trauma or non-trauma-based dental condition is due to the loss of the employer-sponsored dental insurance coverage caused by the pandemic [29]. Even in the post-lockdown phase, the impact of COVID-19 has far-reaching consequences as there is an opinion considering younger patients are not able to comply with the period of preoperative and postoperative isolation that might be required in tandem with dental trauma management due to their commitments towards their employment, children at school or care for elderly family members [30]. Dental trauma care for elderly patients is also another concern as they are at greater risk of developing severe reactions and morbidities related to the COVID-19. This opinion is supported by a recently cited United Kingdom study have noted a reduction of TDI cases in patients aged range of 50 years of age [9].

The next loci impeding the management of dental trauma revolves around the dental service provider force as well as the amenities that are involved in the treatment. One concern is the limitation of available dental care providers as many dental staffs may have redeployed to the frontline for COVID-19 testing or triaging roles as well as being furloughed thus limiting access to dental care [29]. A web-based survey done in Brazil divulged that many dentists who attended emergency or dental trauma patients proceeded so without auxiliary dental staff support to minimize infection spread and due to manpower restrictions [31]. From another viewpoint, limiting the number of dental personnel during AGP is essential to minimize the propagation of COVID-19 though this is likely to draw the procedure time even longer than the usual. In the private sector, dental practitioners are burdened by financial issues resulting from reduced working hours and limited dental procedures that could be performed.

On the other hand, public health workers including dental practitioners have experienced stress and depression during the pandemic period caused by increased workload, constant changes in the infection control protocols, social distancing, self-isolation, and caring for deteriorating patients [32]. These conditions could impede their standard of care during the management of dental trauma as well. In addition, older dental practitioners and staffs are more cautious when dealing with dental trauma cases since they are in the more susceptible age group in terms of COVID-19 severe reaction [33]. Younger dental practitioners reported lower anxiety in the same manner whilst the older dental practitioners face greater family and job concerns as well as financial considerations [33].

Next, the adjoining dental amenities can also be a barrier in the treatment of dental trauma as will be expounded here. The use of an intraoral radiograph to assess dental trauma for conditions like an intrusion, lateral luxation or crown-root fracture is ideal during the initial treatment phase for such conditions. It is one of the most common forms of radiographic technique in dental imaging. However, the use of intraoral radiographs involves placement of the radiograph film inside the mouth leading to stimulation of salivary secretion and activation of gag reflex leading to etching and coughing [3, 29]. This is undoubtedly not suitable as the dispersion of droplets and bioaerosols will be increased. This situation is made worse by the fact that most dental procedures are the aerosol-generating type as the tools used as air-driven handpieces, ultrasonic scalers, piezotomes, cautery units as well air-water syringes [25]. Dental avulsion, intrusion, and luxation injuries routinely require the placement of splint using composite resin requires the use of air-drying syringe while removing the splints requires bur cutting and suctioning. Hence the issue of minimizing the use of such tools during the management of dental trauma would be a barrier to providing sound treatment.

Based on the UK Office for National Statistics, dental practitioners and auxiliary staff deal with their patients in proximity inferring the possibility of increased exposure to general disease and COVID-19 [34] due to splashback of saliva or bioaerosols. Efforts to minimize and reduce the salivary viral load are another concern that could hinder the treatment of dental trauma in patients with a high risk of COVID-19 especially the routine mouthwash such as chlorhexidine may not be effective against COVID-19 [35, 36]. Disinfection of tools and surfaces of the dental clinical surfaces for COVID-19 includes a waiting period to allow the aerosols generated in the previous session to dissipate. This means an increase in waiting time and further delays in the provision of treatment, especially in healthcare facilities with high trauma case flow [29]. Additionally, the use of fumigation is not considered a practical option in dental surgery as it will further increase the waiting time for starting the procedure [3]. Additionally, methods to minimize follow-up for dental trauma management are also a hindrance as a treatment for such condition usually requires frequent follow-up to ensure no morbidities ensues.

Next, the limitation in healthcare facilities and policies are identified as potential blockades in the provision of dental trauma emergency care during the COVID-19 pandemic. It is not unusual to observe that during budget deductions in hospital or emergency services; dental benefits or dental treatment budgets are among the first service to receive cuts [29]. This is likely to hamper further the effort in providing sound dental care for trauma cases. Additionally, most dental healthcare facilities can be under great strain to provide personal protective equipment (PPE) for their staff and to stay ahead of the curve in the evolving infection control policies regarding COVID-19 [9]. The next challenge includes the availability of a negative pressure

room for dental trauma procedures which will be very ideal; however, most if not all dental facilities still lack such options as most dental operatories are clustered in open spaces without physical barriers. Other limitation includes the availability of teledentistry in most dental healthcare centers as well as emergency centers. Teledentistry is a viable tool for triaging and follow-up assessment by dental practitioners without direct contact with patients [37]. Some challenges may still ensue in the implementation of teledentistry in all dental healthcare facilities as there is the need for dental personnel to acclimatize to this new technology, whilst managing, sharing, and disseminating personal-medical information on their patients.

Overall, the hindrance or limitations mentioned above must be addressed expediently to minimize the delay of comprehensive dental trauma treatment secondary to COVID-19 limitations as it will inevitably create a backlog of cases. Health issues in the oral cavity will most likely occur in such cases especially if regular follow-ups and care are not available. In addition, the consequence of substandard dental trauma treatment will flare up, especially in cases involving children with deciduous or mixed dentition as it could affect permanent dentition and thus increase the need for further dental care in the future. Finally, the current implementation of biosafety in clinical dental practices may compromise the cost of dental consultation and reduce the consultation time.

5. Guidelines in the management of dental trauma during COVID-19

5.1 Available guidelines and proposed algorithm in the management of traumatic dental injuries

In the era of the early COVID 19 pandemic, most dental practices were forcibly closed and it was uncertain whether dental services in the hospitals would be able to cope with patients suffering from dental trauma. However, research also has revealed that patients are hesitant to go to a hospital out of worry for the potential risk of contracting COVID-19 [9]. Therefore, it is important to weigh the benefit of managing traumatic dental injuries to the primary dentition and minimizing the risk of transmission of COVID-19 to patients and staff. In published interim guidance for the provision of essential oral health services during the COVID-19 pandemic, it was advised that routine non-essential oral health care to be delayed until there has been sufficient evidence of control in COVID-19 transmission rates at the national, sub-national, or local level [38–42]. This is mainly due to the prolonged duration and the proximity of dental healthcare workers to the patient's facial region. The dental procedures involve close contact and exposure to saliva, blood, and handling sharp instruments; stratifying the dental healthcare workers as high risk of being infected with COVID-19 or passing the infection to patients.

Multiple guidelines were written in conjunction with this cause on resuming general dental services and principles for acute care during the pandemic such as the new 2020 IADT trauma guidelines [20, 38–42]. The focus of the updated guideline was mainly on general information in certain sections, and a table of complications with the recommendation of longer follow-up (yearly till 5 years and beyond). In intrusive injuries, for example, the current recommendation is only to observe and review as opposed to extraction of the primary teeth. More emphasis is placed on conservative treatment rather than pulpotomy or extraction in injuries such as crown fractures and luxation [20].

While the new IADT guideline advocates conservative treatment options following traumatic injuries to the primary dentition during the COVID-19 pandemic, the British Society of Paediatric Dentistry (BSPD) and Dental Trauma UK suggest treatment options should focus on either observation or extraction [43]. This approach minimizes the number of face-to-face contacts and reduces aerosol-generating procedures. The BSPD has published consensus guidelines on the management of dental trauma concerning the COVID-19 pandemic, including acute management of traumatic injuries and follow-up care. Remote consults are recommended during follow-up to assess oral hygiene, healing, and complications. If deemed necessary, the patient is seen in the clinic for detailed assessment and treatment. All follow-ups could be made through remote consults for root fractures 1 week, 4 weeks, and 1-year intervals after the injury. For enamel-dentine fractures, the follow-up could also be remote, and the recommended time is 8 weeks.

In supporting tissue injuries, for example in lateral luxation and intrusion, which have higher risks of sequels and require more frequent follow-ups, the guideline recommends that remote consult be performed. Remote consult for review at 1-week for all supporting tissue trauma and, depending on the type of trauma, at 8 weeks, 6 months, and 1 year of follow-up are required. Post-injury advice should include care not to further traumatize the injured teeth while eating and encouraging the patients to return to normal function as soon as possible; oral hygiene instructions that include cleaning the affected area with a soft brush or cotton swab combined with an alcohol-free chlorhexidine gluconate mouth rinse.

In the meantime, the Scottish Dental Clinical Effectiveness Programme published a guide on the management of acute dental problems during the COVID-19 pandemic [44]. In the cases of dental injuries that don't require urgent medical attention, patients are advised to clean the affected area with mild antiseptic and to apply ice packs and pressure on the injured soft tissue to stop bleeding. Urgent care is recommended for avulsed, luxated, or fractured teeth. In the case of the avulsed primary tooth, they should not be re-implanted, instead, it is recommended for self-help and consultation that include appropriate analgesia followed by advice on a soft diet.

In tandem with guidelines by the BSPD and Dental Trauma UK as well as the Scottish Dental Clinical Effectiveness Programme, the King's College Hospital has published new standard operating procedures specifically for the COVID-19 pandemic, published by Ilyas et al. [45] in June 2020. This guideline is also recommended on telephone advice only or a dental visit to perform extraction as management of primary tooth trauma during the pandemic. Telephone advice only is given for all cases of dental trauma that does not interfere with occlusion/airway risk. Only enamel-dentine fractures and pathological mobility, causing occlusal interference/airway risk are recommended to be seen urgently for treatment.

The Royal College of Surgeons of England also published the recommendations for pediatric dentistry during the COVID-19 pandemic of COVID-19 [46]. These guidelines recommended that no routine dentistry should be provided for children during this pandemic and treatment should be deferred to minimize the risk of transmission of the disease to patients, staff, and the public. They also recommended that urgent management is only indicated in pulp exposure or severe luxation that carries a potential airway risk or is severely interfering with occlusion for primary teeth. To reduce the need for AGP, extraction may be the preferred treatment option for children with pulpal symptoms. The aim of trauma management should be to minimize the number of visits required and the number of AGPs provided. Outcomes should be optimized by giving evidence-based initial management with a low risk of complications requiring further intervention.

In Malaysia, a guideline or standard operating procedures were published urgently in view of the pandemic in early 2020. During the early phase of COVID-19, all dental clinics in Malaysia were to suspend their services except for emergency dental treatment including dental trauma. Therefore, all dental trauma cases were channeled to hospitals for urgent management. Following that, more revised protocols focusing on PPE and patient screening were published to allow the opening of dental services again with restrictions. The ministry of health published the guideline on “Management of COVID-19 screening in dental clinics” and circulated it in January 2020 concerning the Interim Guidelines Novel Coronavirus (nCov) in Malaysia. This document mainly addressed the concerns on the identification and handling of positive COVID-19 patients or Person Under Investigation (PUI) at the

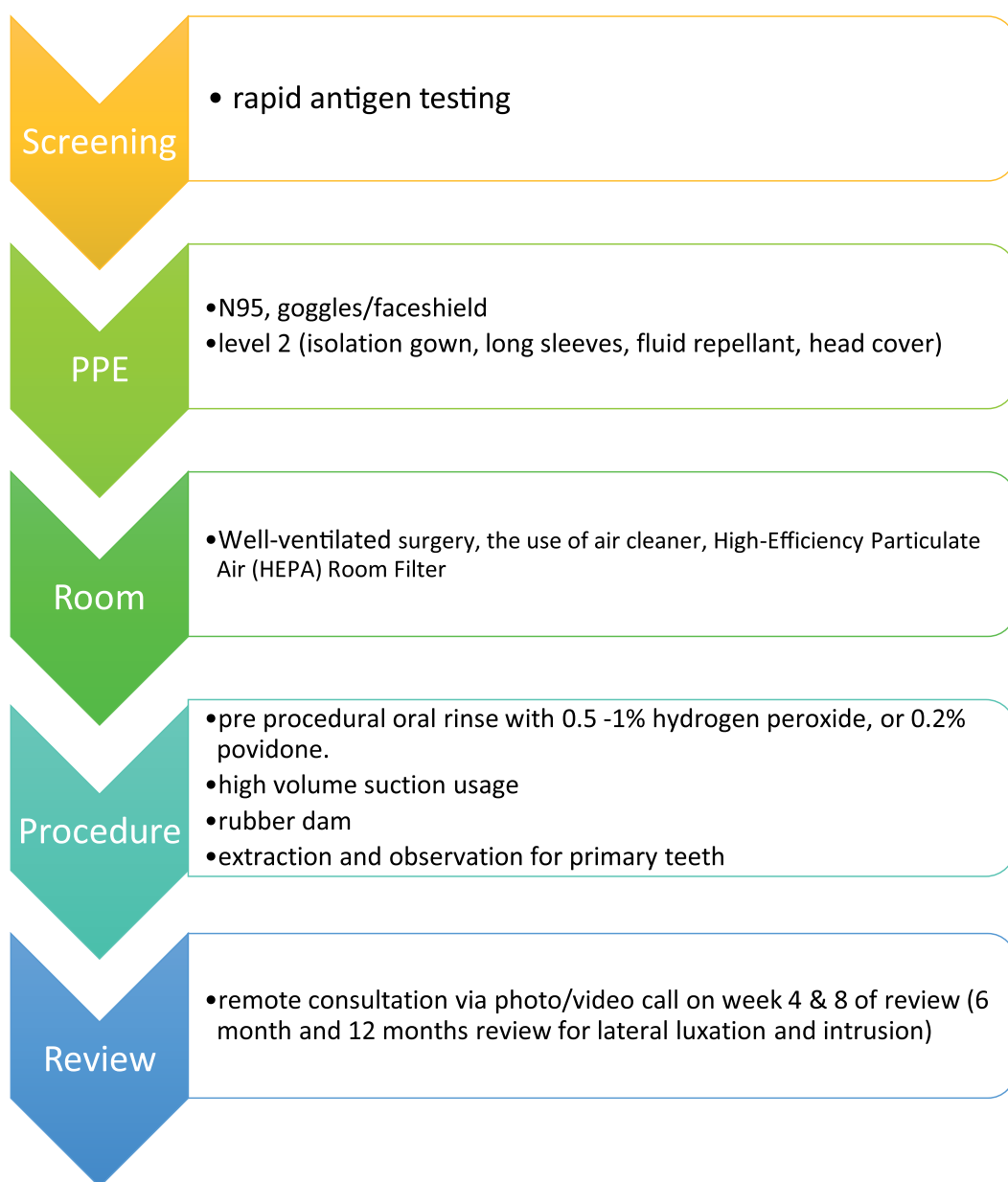


Figure 1.
Proposed algorithm for management of TDI during COVID-19.

point of screening/triage prior to dental treatment. Several amendments had been made to the protocols to ensure it is updated and kept abreast with other international guidelines given their rapid change of management.

In summary, there are some similarities observed in published guidelines during the pandemic. Regarding treatment options for example, although some guidelines recommended conservative treatments (i.e., pulpotomy, composite build-ups, root canal treatment, and repositioning and splinting) during the COVID-19 pandemic, BSPD Dental Trauma UK, The Royal College of Surgeons of England as well as King's College Hospital protocol, however, suggest treatment options should focus on either observation or extraction. These guidelines recommended that a more definitive treatment, such as tooth extraction, may avoid recurring visits to the dental office and thus reducing the risk of exposure to COVID-19. Following an acute injury, most of the guidelines are encouraged remote consultation (e.g., telephone, photographs, or video conferencing) that can help clinical teams to clarify a provisional diagnosis and treatment. An effective remote consultation may also reduce the face-to-face time in the clinic, thereby maximizing the potential use of the clinic and minimizing PPE usage. Only selected cases may require an initial face-to-face consultation to ensure an accurate diagnosis where remote consultation is not possible, or diagnosis is uncertain. Follow-up appointments are necessary to assess healing, oral hygiene, and complications in the intervals of 1 week up to 5 years of the review were recommended with the intervals of remote and face-to-face consultation. Beginning a road to recovery will require "new normal" management. As part of the recovery, clinicians are recommended to completely re-evaluate how services are prioritized and delivered. Relieving children of pain must take priority over routine dental care services [47]. These guidelines are likely to evolve as dental services return to normal, at which point this guide will be withdrawn in preference for the new 2020 IADT trauma guidelines.

Below is the summary of the proposed management algorithm for dental trauma during the pandemic following various guidelines worldwide (**Figure 1**).

6. Conclusions

Traumatic dental injuries are among the dental emergencies that must be addressed as early as possible to ensure the survival of the tooth with good treatment outcomes and a better prognosis. In a long run, this reduces the number of visits, number of treatments, and cost as well as the time of treatment needed in the future. During the COVID-19 pandemic, the etiology of the injury has also shifted to accidental falls, and interpersonal and domestic violence since most countries implemented the movement restriction orders, school closure, and travel restrictions—all accounting for to stay home policy. The incidence of TDI across many countries has shown a change in age predilection and the characteristics of dental injury.

Special management protocols for immediate dental trauma management have been forwarded by many guidelines and various modified measures have been suggested to reduce and regulate droplet and aerosol contamination in the emergency dental setting has been discussed. This includes the screening of the patients before procedures, reduction or avoidance of droplet/aerosol generation in emergency dental situations, the disinfection of the treatment field, application of a rubber dam, and pre-procedural antiseptic mouth rinse, and the dilution and efficient removal of contaminated air utilizing the air filter. Some cases are even consulted via teledentistry

to reduce the face-to-face contact between the dental healthcare worker and patients during pandemics.

With the available guidelines for treating dental diseases during the COVID-19 pandemic time, some dental practices can safely return and restart operations, other practices may choose to remain closed or limit services to only those critical or emergency procedures that cannot be delayed due to expected risks and existing safeguards.

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Conflict of interest

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