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Demography of maxillofacial fractures cases and modifications of management protocol during Covid-19 pandemic

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ABSTRACT

Objectives. Following the SARS-CoV-2 pandemic, all health care professionals were forced to change their methods of managing patients who come to the hospital for different diseases. The purpose of our study is to report the experience of this period, regarding: the study of demography in the presentation of facial and maxillary facial fractures, as well as the description of precautions taken and changes in management methods during the treatment of these cases. *Materials and Methods*. The study was performed in a tertiary care hospital, as a descriptive study on 30 consecutive patients with faciomaxillary trauma admitted to our hospital since the onset of the Covid-19 lockdown. The demographic data and the management protocol of the patient with facial fractures were noted and interpreted. *Results*. We found that several men suffered maxillofacial injuries as a result of RTA, despite the lockdown. Middle face fractures were the most common that required surgery. Sixteen patients underwent surgery in view of malocclusion and complex facial lacerations. Intra operative important steps were taken to reduce aerosol generation in the form of quick intubation, lower power settings of bipolar cautery and drill, islet application and use of self-drilling screws thereby reducing OT time as well. Post op. minimal malocclusion was seen in 5 (30%) patients who had undergone arch bar application and in 2 (12%) patient who had undergone islet application. *Conclusions*. Understanding patient demography is crucial for redistribution of hospital resources especially during a pandemic. Adaptable and flexible guidelines are required at every stage to ensure adequate patient treatment as well as limit any cross infection. Proper fixation of all fractures as per universal recommendations should be preferred always.

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Introduction

COVID-19 pandemic is caused by a novel coronavirus, now known as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). It causes acute respiratory infectious disease and is transmitted through the respiratory tract [1]. Hubei province in Wuhan city of China was the Covid-19 epicenter from where it has rapidly spread to the rest of the world [2]. India saw its first Covid-19 case in January 2020 in Kerala. On 22 March 2020, India went into lockdown to contain the spread of the Covid-19 infection [3].

The pandemic has shaken up the health care system in the past year since it started. Management and treatment of all patients had to be streamlined and regulations had to be made to ensure patient and health care workers (HCW) safety. Maxillofacial trauma examination requires close contact with naso-oro-pharyngeal system and the fracture fixation surgery is an aerosol generating procedure (AGP). Hence out department set protocols for the management of such cases. A patient can be diagnosed only after 5-7 days of exposure to the virus [1], so a negative RTPCR or Negative Gene expert report should not be an indication to let our guard down at any time. The demographic analysis of maxillofacial fractures is important to comprehend the adequate way to treat patients and allocate human and material resources during a pandemic [4].

We aimed to study the demographic profile of the patients and documented modifications in the management of maxillofacial fractures cases during this initial start of pandemic lockdown, for the benefit of both patients and healthcare professionals.

Materials and Methods

This retrospective descriptive study was done during Covid-19 pandemic's first wave in India from March-

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December 2020 in a tertiary referral hospital in South India. The study was initiated after approval from the Institutional Research Committee. The data was collected from archived records of 30 consecutive patients admitted with maxillofacial soft tissue and bony injuries. Data recorded was patient details, mode of injury, site of fracture sustained, the history of covid, the details of the treatment, including the method of protection (Figure 1), the surgery adopted and the postoperative results obtained. All patients admitted with maxillofacial soft tissue and bony injuries were included in the study. Archived records with incomplete data were excluded from the study. The data was collected and entered to Microsoft Excel spread sheet and the percentages were calculated for statistical analysis.

Figure 1. a) Level 1 PPE b) Level 2 PPE

Results

Twenty-one men and 9 women were included in the study (2.3:1). 13% (4) were children <18yrs. Most maxillofacial fractures were due to road traffic accident (94%), followed by fall from height (3%) and accidental fall at home (3%). Most common site of fracture was to mid face region (64%), followed by mid and lower face region (20%) and pan facial region (10%). Isolated mandible fractures were seen in 6% patients. 53% patients (16) had malocclusion at presentation and 43% (13) patients had Class I (normal) occlusion. 1 patient was edentulous. 10 out of 16 (63%) patients underwent arch bar application and plating, while the remaining 6 (37%) underwent islet application and plating. In 9 patients (56%) self-drilling screws were used (Figure 2). Post op. minimal malocclusion was seen in 5 (30%) patients who had undergone arch bar application and in 2 (12%) patient who had undergone islet application. Associated facial soft tissue injuries was seen in 6 (20%) patients. 5 patients had polytrauma and 3 patients had associated orbital injuries.

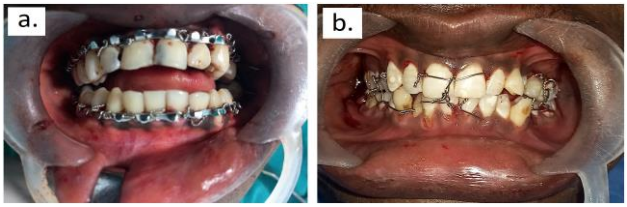

Figure 2. a) arch bar b) eyelet wiring

Discussion

Changes in demography of maxillofacial injuries due to variations in human activity during normal times and when a calamity occurs has been well documented [5-7]. This is necessary to understand how hospital resources can be re allocated to deal with the said calamity at the time. In our study maxillofacial injuries was seen more in males than females. Males are more involved in driving for outdoor activities, travelling, driving profession and outdoor sports. Alcohol consumption and driving under influence of alcohol is also more common in men. This high incidence in males has been documented in other epidemiological studies too [8,9]. Road traffic accident (RTA) has been the foremost cause of maxillofacial trauma [10,11] in pre covid era. Our study has also shown most maxillofacial injuries were due to RTA, despite it being a lockdown period with restricted vehicular movements. This is attributed to driving at high speeds as roads were 'empty', not following traffic signals, not wearing helmets or seat belts, driving under influence of alcohol and poor road conditions [12]. This is supported by a multicentric study done in Italy during the covid-19 pandemic where incidence of maxillofacial trauma due to RTA remained unchanged [4]. Whereas studies done in France and New Zealand showed reduced maxillofacial fracture cases due to RTA [13,14]. Other causes for maxillofacial injuries are fall from height, human and animal assault, domestic violence and sport injuries [10]. Increased maxillofacial trauma cases due to domestic assault was observed in a multicentric study done in France during the covid-19 pandemic [13]. We did not see any patient sustaining maxillofacial injuries due to domestic violence, this could be due to under reporting of such cases in our country.

Type of maxillofacial fractures sustained was documented from face CT scan done for all patients with facial injuries. Our study showed most fractures sustained to the mid face region followed by mid and lower face regions and then pan facial regions. Midface fractures being most common region of injury was also shown in other studies in literature [11,15,16]. Isolated mandible fracture was least commonly seen in our study. This contrasts with studies by other authors who have shown that isolated mandible fractures are most common [10].

However, there is no available data on variations in pattern of facial fractures during covid-19 pandemic.

The main mode of covid-19 transmission is through droplets from asymptomatic or symptomatic patients while speaking, coughing, sneezing or from naso oral secretions [17]. Examination of maxillofacial patients requires the HCW to come in close contact with the patients naso-oro-pharyngeal regions which have high viral load of covid-19 [18]. It is crucial to contemplate on the ways to keep HCW and patients safe as well as ensure patients get the required treatment. A working protocol is required at multiple levels from patient arrival in emergency room upto patients discharge and follow up. The recommendations need to be easily adaptable and flexible to suit the needs of the hospital treating covid and regular cases. As maxillofacial injuries are varied, it is extremely important that each patient's treatment is done on a case-to-case basis, with final decision being taken by the consultant in charge of the case [19].

The following modifications in our approach to assess and treat maxillofacial patients were done. Our hospital was divided into covid and noncovid areas. All HCW were taught donning and doffing methods for wearing personal protection equipment (PPE) methods by the hospital's infection control team. HCW worked in separate teams to avoid quarantine, is infected, of all at the same time. Maxillofacial trauma patients were first evaluated in the emergency room by HCW wearing Level I personal protection which included N95 mask, face shield or eye glasses, fluid resistant apron, cap and surgical gloves. Along with regular history, travel details, contact with covid patients and covid symptoms history was noted down. Repeated evaluation by other HCW or teams was avoided whose consultation was not required urgently. Patient details were discussed with senior consultants of concerned departments via phone and CT scans of face were viewed remotely via the hospital's digital system. Minor face injuries were managed by HCW in the emergency room [20]. One patient one attender ratio was maintained. Rapid Antigen Test (RAT) was done in emergency room for those patients requiring admission as per the hospital protocol. Admission criteria involved polytrauma with concomitant maxillofacial injuries, patients with malocclusion, orbital injury and complex facial soft tissue injuries.

If RAT result was negative, patients were admitted to plastic surgery ward (noncovid area). All HCW in wards wore Level I personal protection to check vitals of the patients, administer IV fluids, medications and to send RT-PCR test. Importance of oral hygiene was stressed upon to the patients. Mouthwash containing 1% hydrogen peroxide or 0.2% povidone is recommended as the covid-19 virus is susceptible to oxidation [17,21]. Patients and attenders wore mask compulsorily. Visitors were strictly not allowed and change of attenders was also not allowed. None of our patients were covid positive during the study period. If RAT or RT-PCR report is positive, patients should be shifted to covid wards and surgery to be done only if life threatening. These procedures are to be done in covid operation theatres (OT) with negative pressure and with HCW wearing Level II Personal protection equipment (PPE) or powered air purifying respirator (PAPR) [20,22].

We operated only on those who had clinically evident malocclusion (16 patients), fracture of orbital floor with entrapment of contents (1 patient) or infected (1 patient) or complex facial soft tissue injuries (5 patients). Other indications for surgery during a pandemic, as mentioned in literature, include nasal septal hematoma evacuation and orbital apex syndrome. Fractures of zygoma, orbital walls and nasal fractures are to be delayed for later date, though there may be a chance of aesthetic deformity in them. This is done to prevent unnecessary exposure of HCW, conserve OT resources, reduce PPE utilization and decrease patient hospitalization burden. Patients and attenders need to be counselled in their own language the risks associated with the pandemic and the risks involved in delaying the surgery [20]. The lack of availability of human and material resources has caused many institutions across USA and France to defer operating on maxillofacial surgeries unless life threatening [13,23]. Five patients had polytrauma - concomitant head or abdomen or long bone injury requiring management under respective departments and 2 patients with orbital injuries required observation by ophthalmology team. Post op minimal malocclusion was seen in 5 (30%) patients who had undergone arch bar application and in 2 (12%) patient who had undergone islet application, for pandemic times when lifesaving is the primary goal, this can be accepted. But in normal circumstances proper fixation of fractures is advocated as the universally recommended protocol.

There is documented evidence of increased aerosolization of respiratory droplets in OT during airway related procedures and during intra oral surgeries [24,25]. This directly amplifies the risk of exposure to the HCW. Thus, at all times minimal theatre staff should be present wearing Level I personal protection [20]. As endotracheal intubation is an AGP, it was done swiftly by experienced anesthetist. The operating surgeons waited outside the OT till 20mins post intubation. Studies have shown that following AGP, micro-organism are cleared 99% by 14mins and 99.9% by 21 mins depending on the OT air exchange per hour [26,27]. Intra oral preparation was done using povidone iodine solution. The efficacy of povidone iodine solution in decreasing aerosol and droplet generation during oral surgeries is well documented [17,21,28,29]. We followed AO-CMF surgical protocol for facial fractures. It included the use of scalpel instead of monopolar cautery for mucosal incision, use of bipolar

cautery on lower power setting to achieve hemostasis, use low speed drill with minimal saline irrigation, usage of suction for the smoke and irrigation and to use osteotome instead of power saw where indicated [30]. All this is done to reduce spread of the aerosolized droplets during the AGP.

We further simplified the surgical steps where possible by using islet application and self-drilling screws. Ten patients underwent arch bar application and 6 underwent islet application. This was decided by the operating surgeon based on type, site and complexity of the fractures. Self-drilling screws are available for use in mid face fractures only and it was used in 9 patients. As the drilling step was bypassed, it avoided aerosolization and reduced operating time for such cases. Associated facial soft tissue injuries was seen in 6 patients which required dermabrasion, debridement and suturing.

If Class I (normal) occlusion was achieved intraoperatively at the end of fracture fixation, the arch bar and islets were removed. If Class 1 occlusion was not achieved the arch bar was not removed. For such patients post operatively in the wards guiding elastics were applied. These patients were then re admitted after 6 weeks for arch bar removal in operation theatre with negative RT PCR report. Patients were discharged at the earliest following surgery. Follow up by teleconsultation was encouraged where possible. For facial suture removal patients were called to the outpatient department. All OPD procedures were done with HCW in Level I personal protection.

Conclusions

Preparation and readiness by hospital and HCW is the first step in handling any crisis. Adaptable hospital guidelines at all stages of patient care are preferable. Safeguarding vital resources and ensuring low viral transmission is salient at every step. RTA has remained the primary cause for maxillofacial injuries during covid-19 pandemic, even during a lockdown period. Awareness on road safety and improving quality of roads needs to be emphasized.

Midface fractures were more common in our study for which self-drilling screws are ideal to use, reducing aerosol generation and OT time. Arch bar versus islet application depends on fracture complexity with recommendation for its remove at same surgical sitting. Follow up via teleconsultation is the way forward. Proper fixation of all fractured segments is reiterated for good post op occlusion.

Conflict of interest disclosure

There are no known conflicts of interest in the publication of this article. The manuscript was read and approved by all authors.

Compliance with ethical standards

Any aspect of the work covered in this manuscript has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

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