DOI: 10.7860/JCDR/2015/14436.6892

Review Article

Education Section

Disaster Management and the Role of Oral Maxillofacial Surgeons

VIVEKANAND SABANNA KATTIMANI[1], RAHUL VINAYCHANDRA TIWARI[2], SRINIVAS CHAKRAVARTHI PANDI[3], SRIDHAR MEKA[4], KRISHNA PRASAD LINGAMANENI[5]

ABSTRACT

"Disaster" the word itself suggests an event resulting in great loss and misfortune. In this developing world, India is becoming more powerful and is shining across the world. But we are still left to deal with various disasters, so that no harm comes to mankind. India has the occasional national disaster to which we have to promptly respond. Like the rest of the world, India has become a terror prone nation and recent attacks since the last decades affected not only the function but also it made citizens insecure. As we are in a large nation so, no matter how large a disaster it may be; we have to overcome it.

The oral and maxillofacial region in a human body is very delicate with complicated anatomy, which decides the life of a human being. The management of disaster is a multitask approach, in which maxillofacial surgeon plays an important role. It is a very difficult task to operate in disaster zone. It is essential for a surgeon to make quick and important decisions under stressful conditions. Usually the surgeries are performed in a well-equipped hospital but, when it comes to disaster zone the surgeon have to treat the patient with a minimal armamentarium available within a fraction of time. The surgical competence in a disaster field is an alarming situation. Disaster management itself is not an alarming situation but the time management is important for better outcomes. A surgeon however should be trained, so that he should not miss injuries for better outcomes along with personal safety. The article discusses about disaster management strategy and guidelines for both oral maxillofacial surgeons and the statuary body to make maxillofacial surgeon as part of disaster management team for better outcomes.

Keywords: Bleeding, Emergency, Management, Syncope, Tracheostomy, Trauma

INTRODUCTION

In the developing world, India is becoming more powerful and is shining across the world. But we still need to deal with various disasters so that no damage should happen to humanity. We have occasionally come across the national disaster viz. natural calamities, terror attacks and so, which requires prompt response [1]. There are terrorist attacks since last decades, which not only affected the function but also made the citizen insecure. As we are in a large nation, so no matter how large a disaster may be, we need to combat it.

The management of disaster involves many people including first hand responders, police personnel, military, paramilitary, ambulance brigade, first aid team, social workers, National Cadet corps (NCC), scout guide, National Service Scheme (NSS) volunteers, home guards, National Disaster response force (NDRF) team members, emergency management doctors and so [1,2]. The scene at disaster requires many skilled personnel; to clear the situation so that it can be effectively handled and many lives can be saved. In some situations the victims need urgent attention with definitive surgical intervention along with emergency management of airway and circulation [3,4]. The specialists are best responders at disaster field if the situation warrants. But it's very important to train such specialist grade doctors to prevent themselves to become victim.

Maxillofacial Surgeons can become good first hand responders during disaster management, if they are going to be trained for management of disaster. The head and neck is a very important part of the body and contains many important structures with cranial nerves and sensory organs with rich vascular supply. Its complex structure needs utmost care as face is the index of mind. The definitive emergency care definitely makes the best outcome with good stability, function, and aesthetics. So the article discusses about various emerging conditions and management in common and head neck in particular with reference to importance of maxillofacial surgeon's role. It gives guidelines for both maxillofacial surgeon and authorities involved to understand the complexity of the matter, so that they can involve specialist as first hand responders on voluntary bases to have better prognosis with good quality of life after post disaster survival without much disability.

COMPLICATIONS OF DISASTER

In the London blasts, some surgeries were performed which required a different protocol [2]. The nuclear devices and radioactive materials used in the blasts were most harmful for life. So, specialist doctors involved in the management should be well trained to deal in such areas where situation is a double edge sword. Disasters like Asian tsunami in 2006 have less injuries but lost more number of lives. Similar incidence of disaster occurred during HudHud at Visakhapatnam in 2014. Management of 'mass fatality' plan must accompany the 'mass casualty' plan, and specialized teams are required to look after each. Also, there is a need for good communication skills to convey difficult news and guarded outcomes in simple language appropriately [3,4].

Different Types of Disaster and Management Strategy

There are various types of disasters which can be natural such as earthquake, volcanos, floods, tornadoes, typhoons, cyclones and man made such as nuclear leaks, chemical leaks, terrorist activities and structural collapse and so [1-4].

The management of the disaster includes both general and medical management. General management requires a team effort which includes NDRF, civil engineers, fire fighters, military and emergency services to evacuate the people. Medical management includes medical first aid representatives, nursing staffs, and specialists at the spot of disaster and at tertiary care hospital. Specialists are better responders and will have a better outcome [1].

It is important for oral and maxillofacial surgeons to get trained with the disaster management team, so that they can perform better in emergency field in life threatening situations. Any kind of disaster whether man made or natural, is a great loss for the country and humanity. Management of head injuries, airway obstruction and haemorrhage is most important; which can be life threatening to the individual. In such conditions the responder should maintain himself in a safe place, since disaster situations there can be changes for any secondary disaster to happen, as in terrorist attacks usually explosives are placed in more than one in place [3]. In floods the water flow must be taken into consideration. In any building fall, electric shocks are the most dangerous. During any traffic accidents, railways or plane crashes the waste must be screened properly [4]. The most important is site seen and site safety after which a surgeon should touch the patient and check the vitals and Glasgow coma scale. During triage this should always be taken care of [4].

Airway: Provision of an adequate airway, prevention of aspiration, and control of haemorrhage are major considerations during emergency management of maxillofacial injuries [5]. The first priority is to provide and maintain an adequate airway and to obtain base line vital signs. The airways of children are proportionately smaller than those of adults and minor oedema can produce sudden obstruction [5]. In multiple injures of a child, the cervical spine should be stabilized during airway assessment. Aspiration is frequent in injuries of mandible and maxilla; and it will be the most frequent complication. The mouth and pharynx should be cleared of blood, food and broken teeth, and victim should be ventilated and intubated. Choosing the correct size of uncuffed endotracheal tube in younger children is important, for insertion of a throat pack at the appropriate juncture [5]. Careful note should be made of this latter fact. Emergency tracheostomy is rarely performed, if necessary. It is preferable to insert no. 14 catheter through cricothyriod membrane initially and then to proceed to operating room for formal tracheostomy under controlled condition [5]. When performing tracheostomy in a child, a vertical incision is preferred. Left innominate vein is cited more superiorly than in adults and can be served by the unwary. Great care should also be taken not to violate the first tracheal ring [5].

Bleeding: The next priority is control of bleeding and establishment of venous access. Direct pressure should be applied to accessible bleeding points as soon as possible [6-8]. This is especially true of scalp laceration, because large amount of blood can be lost in short time. Venous access can be problematic, as peripheral veins are small and marked increase in vasoconstrictor in the presence of hypovolaemia [7]. If percutaneous access is unsuccessful after two attempts, intra osseous infusion in children younger than six-year-old or direct venous cut down to the greater saphenous vein at the ankle in older children should be considered [8].

Shock: Almost all cases of shock in traumatized children are related to haemorrhage. Because of small blood volume in children even 20% of blood loss leads to significant circulatory compromise. Tachycardia, cool extremities, and systolic blood pressure of less than 70mm of Hg are clear indication of shock [6]. When shock is diagnosed, fluid bolus of 20ml/kg of warm crystalloid should be given. If this amount is adequate, the heart rate will become slow, systolic blood pressure will increase, the extremities will become warm, skin mottling will decrease, the sensorium will clear, and there will be urinary output of 1ml/kg/Hr [6,7]. If these do not happen, a second bolus of same magnitude should be given, as well as be prepared to give the infusion of type specific or O-negative packed red blood cells the help of paediatric surgeon should be sought promptly, if this scenario continues which may go in favour of undetected bleeding.

Head Injury: A word of caution about head trauma in children; vomiting is common but does not necessarily imply increased intracranial pressure. However, if it becomes more frequent, a neurosurgical consultation should be requested [7,8]. Overall survival is related more to the recognition and prompt treatment of associated injuries than head injury itself. Adequate restoration of an appropriate circulating blood volume is required to prevent hypoxia.

Laryngeal Injuries: Laryngeal injuries are uncommon in children, but are of particular concern owing to the narrow diameter of airway [6]. Whereas 3 or 4 mm reduction in diameter of the larynx or trachea is of little consequences in an adult, but in an infant or young child it causes airway embarrassment [5]. Dyspnea, change in voice, and bruising of neck suggest laryngeal injury. Such patients should be examined by a suitably trained paediatric otolaryngologist.

Injuries requiring immediate treatement mandate: Certain injuries usually mandate immediate treatment. The sequencing of repair includes an unstable airway, haemorrhage, extensive facial lacerations, avulsive wounds, and gunshot wounds. Failure to recognize the partially or completely obstructed airway can result in life threatening hypoxaemia [5]. A thorough physical examination including visualization of the oropharynx is necessary. Patients who refuse to lie in supine position may be indicating difficulty in maintaining their airway or handling their secretions. This type of situation is seen in patient with gunshot wounds involving anterior mandible, leading to tongue to collapse into the oro-pharynx. Treatment consists of airway maintenance (pulling of tongue forward with towel clip, performing jaw thrust and chin lift, etc.) and then establishing a definitive airway [6].

Usually in hospital we see one patient at a time but when it comes to mass casualties it is not an easy to handle. Proper training and triage is required [3]. Taking care and treating number of patient in such condition is difficult task [7-9]. In a short period of time we have to see maximum number of patients for their benefit. When conditions warrants the senior surgeons should be enrolled who will lead the emergency team [4].

It is very important for a surgeon to make quick and important decisions under stressful conditions. Oral and maxillofacial region with complex anatomy is very delicate; which decides the life of human being. It is very difficult task to operate on a disaster zone as compared to non-disaster zone [3]. Usually surgeries are performed in a well-equipped hospital but when it comes to disaster zone the surgeon have to treat the patient with the minimal armamentarium available within fraction of time. A surgeon however should be trained so that he will be able to manage the situation. Surgical removal of foreign material and dead tissue from wound in order to prevent infection and promote healing is an important factor.

Bleeding associated with complex facial fractures and lacerations can usually be slowed or stopped by applying and maintaining pressure directly to the injured area. Exception to this rule includes deep venous or major arterial bleeding [7]. Direct pressure over laceration usually slows the haemorrhage until the patient can be cleared for surgery. If direct pressure does not slow the haemorrhage, then exposure and control of bleeding under good lighting can be suggested [10]. This task can be accomplished in the emergency room. Placing clamps blindly under the flaps to stop bleeding may injure facial nerve or parotid duct [8].

In general, controlled environment of the operating room is preferred when extensive facial lacerations require haemostasis and vigorous cleaning. Immediate (less than 12 hours after injury) exploration and cleaning are usually important in evaluating and treating avulsive and gunshot injuries. The “examination under Anaesthesia” procedure can help to diagnose injuries and helps to the formulation of definitive treatment plan for the patient [11]. This treatment usually involves conservative debridement, extraction of teeth, placement of arch bars, closure of soft tissue wounds, and placement of reconstruction plate or external fixator. In patients with severe avulsion of soft tissue and wounds which are not possible to primarily closed require reconstruction plate are contraindicated for emergency definitive management [10,11]. If soft tissue cover cannot be obtained such

patients are probably best treated by packing the wound and delaying for free tissue transfer. In avulsive injuries early intubation for airway protection followed by tracheostomy should be strongly considered especially if gunshot traversed the pharynx, tongue or floor of the mouth, or genioglossus attachment has been avulsed [6]. Penetrating trauma to the neck mandates general surgery consultation and frequently neck exploration or carotid angiography to rule out major vascular injury [11]. Although immediate treatment is required in these cases, but it may not be necessary (or desirable) to treat all fractures at the initial surgery.

In many complex cases it is preferable to stage the repair. It doesn't matter whether we are dealing with road traffic accident or a disaster but primary prevention is very important factor [10]. Good preoperative planning will give better surgical outcomes. We must have warning systems so that we will be prepared to deal with the disaster. The hospital houses several faculty, resident doctors, medical students, nursing staff, technicians, ambulance drivers, and support staff, who should be ready resource personality during mass causalities. Every teaching hospital must have Disaster Management Plan (DMP) and cell, which should be kept ready on informed alert system, if such situation happens.

Indian Scenario in Disaster Management: When it comes to disaster management in India there are forces and responders like NDRF, home guards, rapid action force, military, scout guides and NSS Volunteers will come into the picture. Few states have NSS chancellor's brigade for disaster management viz. Maharashtra University of health sciences Nasik, Maharashtra.

National Emergency Communication Plan (Phase II) aims to provide VSATs for voice, data and video communication between National Emergency Operation Centre, NDRF and NDMA [12-15]. School Safety Program aims to promote culture of safety in schools. National Earthquake Risk Mitigation project aims to enhance preparedness of the nation to face earthquakes and to reduce loss of life and property caused by earthquakes [12-15]. National Landslide Risk Mitigation Project aims to strengthen the structural and non-structural landslide risk and vulnerability in hilly districts prone to landslides and mud flows [12-15]. National Flood Risk Mitigation Project aims to mitigate consequences of floods by improving capacity for effective preparedness, promptness in response and to assess the risk and vulnerabilities associated with floods [12-15].

Major Activities which have to be carried out are as follows [16]:

- Strengthening of forecasting and early warning systems.
- Providing technical support for more than 200 computers modelling and making better use of radar data.
- Designing and demonstrating earthquake retrofitting buildings.
- Providing support to GOI-UNDP multi-donor Disaster Risk Management (DRM) Project and mobilizing expertise from the USA Forest Service (USFS) on Incident Command System and the Federal Emergency Management Agency (FEMA) to key institutions (LBSNAA & NIDM) in India [12-15].

Global Scenario in Disaster Management: In global scenario satellites have made contributions to disaster warning and prevention and particularly hydrological disaster. Earth observation system should be the part of disaster management system, for accurate warning (mainly from low resolution satellite) or to generate accurate map after disaster to access responders. One objective of the scenario is to make a link between global system (based on weather satellites) and local and regional system (based on low and high resolution satellite), in situ sensors and other local/regional data.

CONCLUSION

There must be a quick medical response team ready all the time for such disaster situations. Not only the doctors but also public should be trained for primary care in such situations, because availability of a surgeon at that point of time might not be possible. As such, the studies related with the disaster management have not been systematically done in India except mass causalities. So the present review gives us broad idea about Indian scenario, proposed management and suggestions to various independent professional and government NGO's; so that we can have trained man power in specialist cadre.

NSS and NCC Units are working in India at College level, which makes the highest number of manpower involving youngsters. At formal education colleges and medical university all volunteers should be trained for disaster management preparedness so that the budding youngsters and future doctors will be empowered for proper management of such scenario. When we compare the trained persons including army, we fall short of manpower, when compared to sensex of Indian population. We should aim for at least 25000:1 trained persons for such situation, so that disaster management will become very easy job. All the concerned authorities involved should give a second thought regarding training of students and all health science fraternity batch wise to improve the resource person strength.

General guidelines to have surgeon as first hand responder-

1) All Oral and Maxillofacial surgeons should be trained for sequences of management strategy during disaster.
2) To have volunteer surgeon list and emergency contact numbers and telephone directory with the authorities for easy contact.
3) The disaster management team should have specialist doctor's registry in that particular geography in association with specialty association or state dental council or Indian dental association branch office or dental and medical schools concerned.
4) Every year they should perform mock drills and refresher training to simulate different disaster situations.
5) Each district headquarters disaster management cell should have all above mentioned data in that particular geography, because they are the best persons as first hand responders as it saves many lives. They need not wait for help to arrive from long distance. Also, known local responders are better than unknown responders for that particular geography.

REFERENCES

[1] Jamkar A, Roy N. The Leadership Role of Surgeons in Disaster Management. *Indian J Surg.* 2013;75(4):253–54.
[2] Aylwin CJ, König TC, Brennan NW, Shirley PJ, Davies G, Walsh MS, et al. Reduction in critical mortality in urban mass casualty incidents: analysis of triage, surge, and resource use after the London bombings on July 7, 2005. *Lancet.* 2006;368:2219–25.
[3] de Ceballos JPG, Turégano-Fuentes F, Perez-Diaz D, Sanz-Sanchez M, Martin-Llorente C, Guerrero-Sanz JE, et al. The terrorist bomb explosions in Madrid, Spain—an analysis of the logistics, injuries sustained and clinical management of casualties treated at the closest hospital. *Crit Care.* 2004;9(1):104–11.
[4] Deshpande A, Mehta S, Kshirsagar N. Hospital management of Mumbai train blast victims. *The Lancet.* 2007;369(9562):639–40.
[5] Russell C, Matta B. Tracheostomy: A Multi professional Handbook, Cambridge University Press, 2004.
[6] Walls, Ron M. Murphy, Michael F. editors. Manual of Emergency Airway Management, 3rd Edition Lippincott Williams & Wilkins, 2008.
[7] Mahadevan SV, Garmel GM. In An Introduction to Clinical Emergency Medicine, 1st edition.*Cambridge University Press* 2005.
[8] Berk WA. editors In Detroit Receiving Hospital Emergency Medicine Handbook Fifth Edition, F. A. Davis Company, Philadelphia, 2005.
[9] Hoffman RS et al. In Goldfrank's Toxicologic Emergencies, 8th ed 2006, DOI: 10.1036/007144310X.
[10] Hardt N, Kuttenberger J. Craniofacial trauma Diagnosis and management. *Springer-Verlag Berlin Heidelberg.* 2010. DOI: 10.1007/978-3-540-33041-47.
[11] Thaller SR, Scott Mcdonald W. Facial Trauma. *Marcel Dekker, Inc*. 2004.
[12] Ministry of Home Affairs, Annual Report, 2009-10, GOI. Available from http://www.mha.nic.in Last accessed on 8/9/2015.
[13] Ministry of Finance, Thirteenth Finance Commission Report, GoI. Available from http://fincomindia.nic.in. Last accessed on 8/9/2015.
[14] USAID, India, USAID Project Document. Available from https://www.usaid.gov / crisis/india. Last accessed on 8/9/2015.

[15] UNDP, India, GoI-UNDP DRR Programme. Available from http://www.in.undp.org/content/india/en/home/ourwork/crisispreventionandrecovery/overview.html. Last accessed on 8/9/2015.

[16] Ministry of Home Affairs, GoI. State level Programmes for Strengthening Disaster Management in India. Available from http://ndmindia.nic.in/DM-Booklet-080211.pdf. Last accessed on 8/9/2015.

PARTICULARS OF CONTRIBUTORS:
1. Reader, Department of Oral and Maxillofacial Surgery, Sibar, Institute of Dental Sciences, Guntur, Andhra Pradesh, India.
2. Post Graduate Trainee, Department of Oral and Maxillofacial Surgery, Sibar, Institute of Dental Sciences, Guntur, Andhra Pradesh, India.
3. Professor, Department of Oral and Maxillofacial Surgery, Sibar, Institute of Dental Sciences, Guntur, Andhra Pradesh, India.
4. Professor, Department of Oral and Maxillofacial Surgery, Sibar, Institute of Dental Sciences, Guntur, Andhra Pradesh, India.
5. Professor and Head of Department, Department of Oral and Maxillofacial Surgery, Sibar, Institute of Dental Sciences, Guntur, Andhra Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Vivekanand. S. Kattimani,
Reader, Department of Oral and Maxillofacial Surgery,
Sibar, Institute of Dental Sciences, Guntur, Andhra Pradesh-522509, India.
E-mail: drvivekanandsk@gmail.com

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Apr 11, 2015**
Date of Peer Review: **Jul 02, 2015**
Date of Acceptance: **Sep 10, 2015**
Date of Publishing: **Dec 01, 2015**