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Oral autopsy, procedure, and its utility

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ABSTRACT-

A postmortem examination is conducted to find out the cause of death, weapon responsible for injuries and age of injuries; postmortem interval along with establishing the identity of the dead and finding other facts related to death. Usually, all these queries can be solved by doing a meticulous postmortem examination.

In some cases when the injuries are in the buccal cavity dissection of the face and oral cavity may be required which is usually not done in routine postmortem examination cases.

Sometimes in decomposed bodies, mutilated bodies, a victim of the disaster, or missing persons, visual identification is not possible and identification from fingerprints is not possible or seems difficult and even Identification from DNA seems not possible or difficult, such situations, identification is possible by the study of teeth if the antemortem dental records of the deceased are available with the dentist or smiling photographs of the victims are available.

In such cases, when the muscles of the face are stiff due to rigor mortis and a complete dental examination is difficult, a buccal autopsy may be required for dental charting. The technique and benefits of the buccal autopsy will be discussed in the paper. It is also useful in investigations of cases of negligence in dental treatment and anaesthesia.

This review is conducted to highlight the procedure and importance of the buccal/oral autopsy in different scenarios as this is the most neglected field in forensic odontology and is usually limited to the identification of the unknown person. This paper highlights the utility of the oral autopsy in different causes of death.

Keywords: Buccal autopsy; oral autopsy; dental autopsy; dental identification; intraoral injuries; intraoral pathology.

Introduction

Buccal autopsy is also known as oral autopsy. It is to observe the buccal cavity after the death of the person. When observation is hampered due to any reason, other measures are utilized including the dissection to observe and document the findings in the buccal cavity. When it is especially done to record the dental findings, it is known as a dental autopsy

Oral autopsy provides a unique opportunity to examine the oral cavity and observe and record the dental evidence in detail. There are three main primary evidences to identify the unknown body i.e., fingerprints, DNA profiling and teeth. In unidentified individuals' teeth provide primary evidence for identification and to record the evidence oral autopsy is very useful. It is relatively simple when the rigor mortis has not developed in the body. When the rigor mortis is fully developed it becomes difficult to examine the buccal autopsy and then a special procedure is needed to record the dental evidence by buccal autopsy. Special techniques of oral autopsy give easy access to the buccal cavity.

In cases of mass disaster and missing persons

An oral autopsy is very useful in cases of mass disasters when identification is a big problem and all means are used to identify the dead bodies. Similarly, when some persons are missing and dead bodies are found somewhere it raises

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hopes for the missing person and these hopes can be only fulfilled if the dead bodies can be identified.

Forensic dentists should be involved in dental autopsies in such cases to get the proper documentation of the postmortem dental records of the deceased.[1] These postmortem dental records then can be compared with the antemortem dental records of the person and this helps in the identification. Antemortem record is charted on the yellow page and postmortem dental record is charted on the pink paper to avoid confusion between antemortem dental records and postmortem dental records.

In cases of Professional Negligence

In cases of negligence during oropharyngeal surgeries, gastric lavage, endoscopy, dental treatment and anaesthesia, an oral autopsy can be useful to provide evidence of negligence for prosecution in cases of deaths due to negligence.

Anaesthesia during prone position surgeries can also cause complications in the oral cavity which can be observed and documented by the oral autopsy.

In compensation cases due to negligence of anaesthetics, 6% of the cases are due to injuries to the airway.[2]

During Endotracheal intubation, there can be complications which can be acute and chronic and if harm or death occurs getting the evidence for the same is important for the successful prosecution.

Due to endotracheal intubation injuries to the oral cavity, oropharynx, larynx and trachea can occur in the form of injuries to the tongue, teeth, mucosa and vocal cords. Supraglottic airway devices and Video Laryngoscopes can also cause injuries. Being a less experienced doctor in intubation can cause more severe injuries, due to repeated attempts.[3,4]

Injuries can be abrasions, contusions or lacerations to the tongue, teeth, mucosa vocal cords and larynx. Treating these injuries can be a financial burden also on the victims and their families.

Dental injuries during anaesthesia in one of the studies in a tertiary care hospital have been recorded in 0.13% of cases during anaesthesia and in 75% of cases it was due to intubation; avulsions of teeth were seen in 50% of cases and Fracture, & luxation was seen in 15% of cases and damage to crowns, bridges were observed in 14% of cases.[3]

Paralysis of vocal cords can be an issue after intubation in the living persons claiming compensation. Haematomas and lacerations have been reported during intubation.[3] all these injuries if present can be documented by oral autopsy.

Due to gastric lavage, there can be perforation of the pharynx[5] which can be recorded during oral autopsy.

During bronchoscopy, there can be bleeding and there can be complications in the vocal cords and glottis and even deaths can be there in the presence of comorbidities. When a rigid bronchoscope is being used there can be damage to the teeth too along with other complications due to fibreoptic bronchoscope.[6]

During dental treatment carried out by dentists, there can be damage to the surrounding structures.

Maxillo-facial surgeons do various surgeries in the mouth and face in cases of trauma, orofacial pathologies, Temporomandibular joints, and dental as well as they are doing cosmetic surgeries and with negligence it may result in causing damage to the surrounding structures e.g. paraesthesia can occur following impactions and BSSO.[7]

Similarly, findings of negligence of ENT surgeons can be observed during postmortem examination of the oral cavity. This can be due to errors in the procedure especially by the trainees.[8]

In other cases, requiring buccal autopsy

It should also be performed in cases when the injuries are present inside the mouth due to interpersonal violence or traffic accidents. Recording such pieces of evidence in the oral cavity will be useful evidence to prove the assaults. Injuries in children are mostly due to sports injuries and accidents as in adults it is mostly due to violence. Damage may occur to the teeth, periodontal tissue, the surrounding alveolar bone or to the gingiva or oral mucosa. There may be infarction or fracture of various parts of the tooth involving only or in a combination of enamel, crown, dentin and, root of teeth. There may be concussion, luxation and avulsion due to trauma to periodontal tissue. There may be a fracture of the alveolar sockets. There may be abrasions, contusions or lacerations of oral mucosa and gingival tissue.[9]

These injuries though may not be responsible for death but are the associated injuries along with other injuries on the body and must be recorded which can best be done by the forensic odontologist.

In suicide cases as well as in homicide cases oral autopsy will be very useful.

Buccal autopsy becomes important in cases of smothering

when injuries can be present inside the lips.

It may also be needed in burnt bodies when visual identification has been obliterated due to burns. Examination of teeth in such cases may provide useful evidence for identification.

When visual identification becomes difficult due to decomposition changes oral autopsy may help in the identification by providing clues to identification especially if antemortem dental data is available.

Pink teeth in the dead body are observed due to bleeding in the tooth pulp and are observed commonly in asphyxial deaths.10 In the dead body during decomposition it may be observed and may be due to red pigment-producing bacteria but needs further studies.[11] The intensity of the pink colour is higher in the cervical region of the teeth and may also be seen in carbon monoxide poisoning histologically in the dentin red-brown discolouration is seen and pink discolouration may be due to derivatives of haemoglobin entering the dental tubules.[12]

In cases of inhalation of fumes and smoke examination of the oral cavity is important and should be carried out. Soot may be present in the oral cavity indicating inhalation.[13]

Scalds and burns may be present in the oral cavity when hot liquids or hot food is ingested. Scalds are seen mostly in children when they try to ingest hot liquids usually from the spout of a kettle and even glottis get scalded along with other structures.[14]

It is also important to record the findings in cases of anaphylactic deaths when we can see the changes in the glottis.

It is also important to find out the details of the intraoral pathology if it is responsible for the sudden and unexpected death of the person and the cause of death is doubtful.

In cases of sexual assault collecting valuable evidence from the mouth becomes important when the mouth has been used for penetration and there may be ejaculation in the mouth. Valuable evidence may also be present when the mouth is used for cunnilingus or bestiality.

It is also important to examine the teeth of the deceased in cases of bite marks done by the deceased.

It is also important in some cases of poisoning when the poison has been ingested or forcibly given to the victim. Some poisons cause local effects in the buccal cavity and for recording pieces of evidence oral autopsy is required.

Some poisons may leave a smell in the buccal cavity e.g. Benzene[15], organophosphorus compounds and aluminium phosphide poisoning A narrow blue line may be present in cases of lead poisoning at the junction of teeth and soft tissue on the gums usually known as the Burton's line.[16] Acid poisoning may leave local corrosive changes in the buccal cavity and teeth. Teeth will be chalky white in case of sulphuric acid ingestion. [17]

Toxins of the e-cigarette may also cause damage [18] though these are not well studied and may be observed during oral autopsy.

Dental autopsy

Autopsies are carried out in large numbers but dental autopsies are carried out in very few cases.[19]

The requirement of the oral autopsy in cases of identification in mass disasters is well established.

An oral autopsy should be also carried out when the faces and bodies are mutilated and the identification seems difficult. In the case of dismembered bodies heads may be thrown at different places than the body and sometimes even the hands are not present with the body so that fingerprints can be taken from these bodies for identification.

It can also be useful when the body is decomposed and visual identification is not possible

To observe the dental and paradental features a skilled dissection is required in all those cases where the rigor mortis has set in and is not allowing to observe and record the number and peculiarities of the teeth.[20] It is also required where due to burns the tissue has carbonized and buccal cavity examination is difficult and its examination is required e.g. in unidentified bodies.[21]

Sometimes dentures may be present having unique features, identification marks or Unique Identification Authority of India Barcode which may help in the identification too. Dentures may have features which may help in the identification.[22-24]

The study of palatal rugae and tongue printing may also help in the identification. [25-27]

Technique of dental autopsy

It requires incisions on the face and neck which can be done differently. Y -Incision of the body can be extended up to the mastoid process and then skin and tissue can be dissected on the neck and face and skin flap can be raised till all structures and teeth are visible as shown in Figures 1 & 2. It also involves the resection of the lower jaw if needed.

Figure 1: Reflection of skin to expose the teeth

Figure 2: Resection of the jaw at the marked place

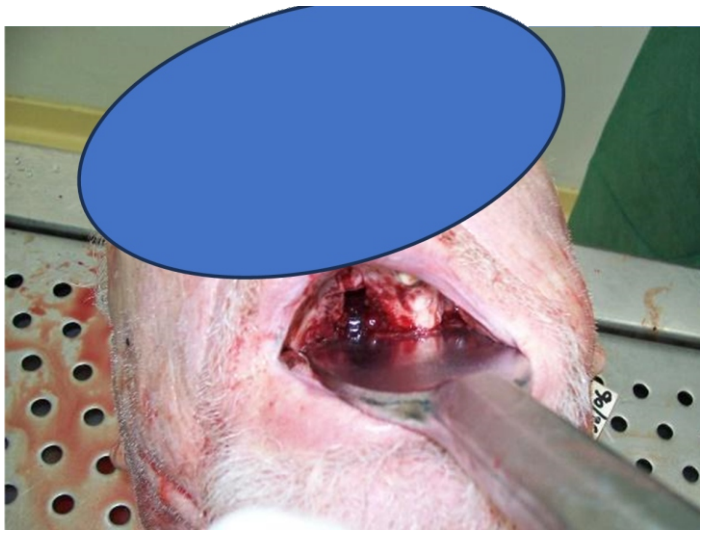

Figure 3: Entry wound by bullet from a firearm inside the buccal cavity

Injuries in the oral cavity can be recorded in a better way by good exposure as in Figure 3 where an entry wound of a firearm can be seen. Injuries may be to the teeth or the Periodontal tissue. There may be injuries to the supporting bone, gingiva or mucosal tissue. It may be enamel infarction to enamel fracture or enamel dentine fracture. It may be a crown, root or combined fracture which may be complicated or uncomplicated. In the periodontal tissue, there may be a concussion, sub-laxation, laxation or avulsion. In the supporting bones, there may be a fracture of the maxilla or mandible involving an alveolar socket or alveolar process. In the gingiva or mucosal tissue, there may be abrasion, contusion and laceration.[9] all these injuries should be correctly documented and these injuries can be better documented by oral autopsy which gives a good exposure of these injuries.

The examination can be visual and radiological.[20] Intraoral Cameras can also assist in this examination in the living persons[28] and this may be helpful even in the dead bodies. Intraoral LASER scanners can also help in this by making an exact 3D print of the buccal oral cavity and teeth.[29] and this can be useful even in printing 3D models of dead bodies too.

In infants and children a special method known as "Aka-Canturk Oral Autopsy Method" is used to extract tooth germs in their development stages.[30]

Hand-held X-ray machines can be very useful in investigating and recording dental evidence. Photography is a good way to record the dental evidence in addition to the filling of the charts and it can be easily reproduced in the courts, A comparison of the front teeth with the selfies can also be done and this will be more helpful by using the apps.[31]

Comparison of the postmortem records can be done with the antemortem dental examination and treatment records, radiographic records, Photographic records, prostheses and models and casts of the deceased. This helps in the identification in case of unknown dead bodies.

For comparison and identification even the software can be helpful e.g. ADIS, DAVID, (CAPMI) and WinID3.[32,33] and may be utilized depending upon the availability of the software system or it can be done manually.

This can also be done by virtual oral autopsy [34] but it has its limitations which should be recognized. It has the advantage that in those areas where there is a shortage of forensic odontologists data can be transferred online and people sitting in remote places can access it and give their opinion.[35] It is a quick method if facilities are available, especially in those where the deaths are less controversial e.g. in accidents and there is the least exposure to pathogens. This also allows us to perform facial

reconstruction.[34]

A robotic postmortem examination is being talked of and being practised selectively[36] and there is a possibility that in the future even a Robotic Oral Autopsy may be possible.

Oral autopsy is usually conducted in the postmortem examination room by a forensic pathologist but for the best outcome of the case forensic odontologist should be a part of the team doing autopsy. In cases of mass disasters where there is a heavy load and number of the forensic odontologists is less then it may be conducted at an authorized place e.g. emergency postmortem examination chamber or odontology Unit but it must be an authorized place by the government. However, in some countries police and judicial officers may send the bones and teeth directly to the forensic odontologists or forensic pathologists may send it to the forensic odontologists for their expert opinion.

Material and methods

Google Scholar and Google Search engines have been utilized to find out the relevant literature using keywords. All the papers were studied the relevant papers were selected and useful papers were included in this study for the review of the literature.

Discussion

As it has been seen in the introduction oral autopsy can be useful in many diverse circumstances e.g., Poisoning cases, sexual assaults, suicides, homicides and in cases of negligence as well as in cases when the establishment of identification is not easy, in such cases oral autopsy can provide the useful shreds of evidences to help the investigation officers to reach some conclusion and ultimately help in the prosecution of the cases.

Oral autopsy is also helpful in humanitarian forensics by helping in the identification of unknown bodies.

It is done by forensic pathologists all over India so far as forensic odontologists are not available. Better is that Forensic odontologists should be part of the team conducting postmortem examinations. Forensic pathologists can send the teeth and teeth embedded in the jaws to do the forensic evaluation. Police and courts can send it directly to forensic odontologists.

Preferably it should be done in mortuary. Emergency mortuary can be created in cases of mass disasters. It can be done in a Forensic Odontology Lab in a dental college/medical college or Forensic Science lab Odontology Unit if dry bones and teeth are recovered from the crime scene.

Preservation of the face is important when the dead body is handed over after postmortem examination. Therefore, an oral autopsy must be carried out in such a way that it causes no disfiguration or at least disfiguration of the face and the body.

Conclusion

Oral autopsies are carried out in very few cases routinely but they can supplement the routine autopsy when the body is unidentified or important evidence of cause of death lies in the buccal cavity. It is needed in cases of mass disasters when there are so many unidentified dead bodies and no means should be left unutilized to identify the dead body. Preferably it should be carried out by the forensic odontologist and forensic odontologists can be good team members in such cases for forensic investigation. Oral autopsy should be carried out whenever indicated

There should be proper authorization for conducting the autopsy. All the precautions should be taken which are done in routine autopsy to prevent the spread of infection. A buccal autopsy will be of immense help in cases of burns, mutilated dead bodies, and decomposed and skeletonised dead bodies where identification is at stake.

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