

Role of forensic dentistry for dental practitioners: A comprehensive study

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Introduction

Forensic dentistry is a challenging and fascinating branch of forensic science that involves the application of dental sciences in the identification of deceased individuals through the comparison of ante- and post-mortem records. From AD 66 till date, dental identification has proved vital in identifying deceased individuals, the first case being accepted by the law in the year 1849, recently forensic odontology has evolved as a new ray of hope in assisting forensic medicine, but this vital and integral field of forensic medicine is still in a state of infancy in India. There are not many institutions offering formal training in forensic

Abstract

Objectives: The aim of present study is to analyze assess the awareness about forensic odontology among dental practitioners in center part of India. **Subjects and Methods:** A cross-sectional study was conducted in a sample of 100 dental practitioners in Bhilai-Durg and data was collected by means of a questionnaire. **Results:** About 30% of dental practitioners not maintain dental records in their clinic, 70% maintained dental records. Nearly, 60% dental practitioners use the appropriate method for diagnosis, while rest are not. Sixty-five percent dental practitioners know the accurate and sensitive way of identify individuals. Thirty percent dental practitioner did not know the significance of bite-mark patterns of the teeth, about 75% dental practitioners did not aware that they could testify as an expert witness in the court of law. Only 15% dental practitioners have formal training in collecting, evaluating, and presenting dental evidence. Seventy-five percent dental practitioners not confident to deal with forensic cases. **Conclusions:** Our study revealed inadequate knowledge, lack of awareness about forensic odontology, among dental practitioners in Chhattisgarh.

Key words: Awareness, dental practitioners, forensic-science, knowledge

odontology, with the lack of job opportunities for qualified forensic odontologists who have obtained degrees abroad.^[1]

“Forensic odontology can be defined as a branch of dentistry, which deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of dental findings in the interest of the justice.”

A forensic odontologist assists the legal authorities by examining dental evidence in different situations. There are three major areas of activity currently in forensic odontology namely:

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1. The examination and evaluation of injuries to teeth, jaws, and oral tissues resulting from various causes (abuse, assault, mass disasters, and crime-related injuries)
2. The examination of marks with a view to subsequent elimination or possible identification of a suspect as the perpetrator
3. The examination of dental remains (whether fragmentary or complete and including all types of dental restorations) from unknown persons or bodies with a view to the possible identification of the latter.^[2]

Importance of identification

Dental hard tissues are extremely resistant to decay, fire, natural calamities, etc., are usually the only remains after an extended period of burial. Since the late 1890s, forensic dentistry has gradually established itself as important, often indispensable, in medicolegal cases, in particular for identification of the dead. The specialty of forensic dentistry generally covers three basic areas, namely,

1. Identifications of human remains
2. Litigation relating to malpractice
3. Criminal proceedings, primarily in the areas of bite-mark evaluation and abuse cases especially child abuse.

Human dentition is considered as hard tissue analog to the fingerprint. It is almost as unique to an individual as a fingerprint. Teeth with their physiological variation and effects of therapy remains to records throughout their lifetime.^[3]

Role of dentist in forensic investigations

Dental identification of humans occurs for number of different reasons and in number of different situation such as for the body of victim during violent crime, fire, road traffic accident, and workplace accident. Body can be disfigured to such an extent that identification by a family member is neither reliable nor desirable. Bodies of people who have been deceased for some time before discovery and those found in water also present unpleasant difficulties in identification. Through the specialty of forensic dentistry, dentist can play a vital role in this process. By identifying the victims of crime and disaster through guidelines and standards, a dentist can assist those involved in crime investigation.^[2]

A number of essential characteristics of the human dentition separate humans from other animals and provide certain uniqueness such as:

1. The first of these results from the intermixing of genetic racial characteristics that have upset the natural balance between size and shape of the teeth and those of the supporting jaw bones
2. The second is the modern chemical and structural modification of teeth resulting from disease processes or the attempt to cure such disease.

Teeth can be used to inflict serious injury on an attacker and maybe the only available defensive method for victim. Alternatively, it is well known that assailants in sexual attacks, including sexual homicide, rape, and child sexual abuse, often bite their victims as an expression of dominance, rage, and animalistic behavior. It should be worth mentioning that children who are unable to crawl cannot cause a self-inflicted injury, and therefore, severe bruising or fractures in a child <6 months to 9 months old are almost universally inflicted nonaccidentally by a second party.

Dental treatment itself is the biggest single contributor to the uniqueness of an individual's dentition and along with development characteristics, is the key to enabling identification of the dead from an examination of the oral cavity, forensic dentistry relies on this indestructibility, and its scientific advancement is designed to extract increasing amounts of identifiable information from oral structures, which more than any other part of the body, mirror the fortunes of the individual concerned. The identification of a deceased individual or of a mark left by his or her teeth is the purpose of the forensic dentist reduced to its simplest terms; forensic dentistry has only two aims, namely,

1. The relatively simple one of identification of the dead and
2. The more complex one of identifying an assailant who has used his or her teeth as weapons.^[4]

In India, qualified forensic odontologist is very few, so an attempt should be made to reinforce awareness among dental practitioner about the person identification and maintaining records of all patients.

The question always arises as to whether the dental practitioner should know about forensic-odontology. Keeping this as the background aim of present study was conducted to analyze and assess the awareness about forensic odontology among the dental practitioners in center part of India.

Objectives are:

1. To analyze awareness of forensic odontology
2. To assess the awareness of forensic odontology among dental practitioners.

Subjects and Methods

1. Population of dental practitioners in Chhattisgarh (Bhilai-Durg)
2. Data collection in the form of questionnaires.^[1]

A cross-sectional study was conducted among 100 dental practitioners in Bhilai-Durg. Data were collected in a personalized manner by means of the questionnaire (Based on Knowledge, Attitude and Practice criteria.) [Table 1] Questionnaire used in study.

Table 1: Questionnaire used in study

Are you aware of the significance of maintaining dental records to identify the individuals?

- For diagnosis or ongoing treatment procedure & long-term follow-up care of the patient
- Administrative or any other purpose
- Evidence against litigation
- Case review purpose
- Compare post & ante-mortem dental data
- Legal settlements of estates where a death certificate needed
- Following details regularly maintained

Do you maintain dental records? (Yes/No)

Dental records regularly maintain? (Yes/No)

Duration of maintenance of dental records? (The health insurance portability & accountability act (HIPAA) require all dental records kept for at least 6 year after the patient's last visit.)

- Patients details (Name, Age, Sex, Address)
- Medical history
- Family history
- Dental history

Do you maintain treatment details of the patients?

- Clinical finding
- Treatment plan
- Treatment log/payment details

Following methods you used for diagnosis

- a. Clinical photograph
- b. Study cast/diagnostic cast
 - For treatment planning
 - Comparing bite mark on crime determination
 - Comparing dental records with teeth after death for individual identification
- c. Radiograph – Forage estimation
- d. Investigation finding-
 1. Hematological investigation
 2. Biopsy

Are you familiar with the subject of forensic – odontology & its relation to dentistry? (Yes/No)

Are you aware that you can testify as an expert witness in the court to present forensic evidence? Yes/no

Have you ever contributed to the identification of victims in mass- disasters? (Yes/No)

If called on to do so would you share your patient's dental records with a government agency to help identify victims of mass disasters? (Yes/ No)

At undergraduate level have you studied the subject "forensic odontology"? (Yes/No)

Which of the following is the most accurate & sensitive method to identify an individual?

- Visual identification
- Fingerprints
- DNA comparison
- Serological comparison in individuals
- Physical anthropological examination of bones & teeth

How can you estimate the dental age of an individual by examining the teeth?

- Radiograph to assess Tooth calcification

Table 1: Contd...

- Morphological & histological changes

Can you identify the Races of the individuals like:-

- Mongoloid (Nepal – Assam)
- Caucasoid
- Negros

Are you aware of importance Bite mark?

- Human/animals teeth
- Orientation & locations of the mark
- Types of injury
- Color, size & shape
- Contour, texture & elasticity of the bite site
- Difference between upper & lower arch

Bite mark patterns may be–

- Abrasion
- Bruises
- Laceration

Are you aware of the method of palatoscopy/palatal rugoscopy used for sex determination in individuals? Yes/No

Are you aware of methods of PCR (polymerase chain reaction) used for identify the genetic relationship between individuals? Yes/No

Are you aware of an advanced method like: ameloglyphics (tooth print)

Have you had any formal training in collecting, evaluating & presenting dental evidence? Yes/No

Would you like to do training course in forensic dentistry if given chances within Chhattisgarh? Yes/No

Results

A total 100 dental practitioners responded to the questionnaire out of these 30% not maintain dental records in their clinic, 70% maintained dental records, 2% participants did not answer the question [Figure 1]. Fifty-five percent dental practitioners did not know to identify child abuse, while the rest said they would identify by physical injuries, scars, behavior, clothing, and nourishment. Sixty percent dental practitioners use the appropriate method for diagnosis, while rest are not [Figure 2]. Sixty-five percent dental practitioners know the accurate and sensitive way (DNA and Fingerprints) of identify an individuals, remaining did not know the answer. Thirty percent dental practitioner did not know the significance of bite-mark patterns of the teeth only 5% participants said that they were part of a forensic team in their respective cities, about 75% dental practitioners did not aware that they could testify as an expert witness in the court of law. Only 15% dental practitioners have formal training in collecting, evaluating and presenting dental evidence. Seventy-five percent dental practitioners not confident to deal with forensic cases.

Discussion

Forensic odontology is an important branch of the study of dentistry that would assist in solving cases of abuses and deaths. Greater knowledge and awareness

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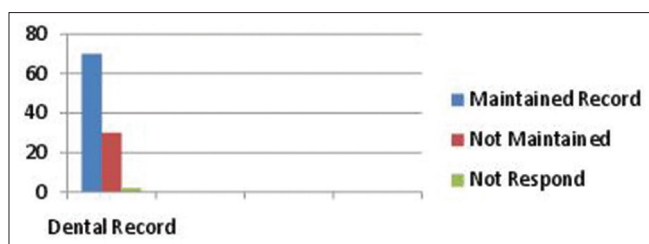


Figure 1: Percentage of dental practitioners, who maintained dental record

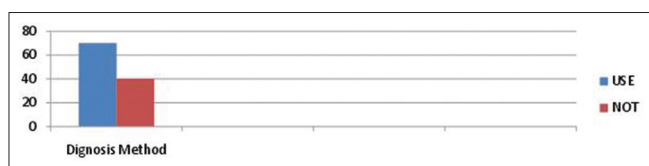


Figure 2: Percentage of dental practitioners, who used appropriate method for diagnosis

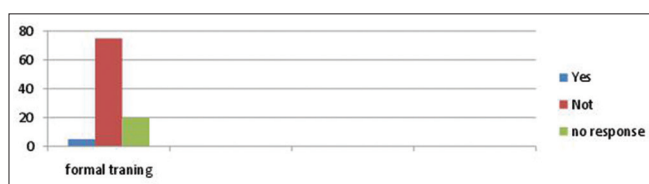


Figure 3: Percentage of dental practitioners, who have undergone formal training in forensic

of forensic odontology among the dental practitioners would be required in the growing field of medicine. The practice of forensic odontology has gained importance in a number of developed countries across the world. However, in developing countries like India, it is yet to gain full momentum. The death toll in India due to the tsunami in 2004 was more than 15,000, but it is a question left unanswered, whether all victims were identified. This could have been made possible if there were adequate forensic odontologist for identification of the victims. The establishment of forensic odontology as a unique discipline has been attributed to Dr. Oscar Amoeda (Father of Forensic Odontology), who identified the victims of a fire accident in Paris, France in 1898.

Today forensic odontology is considered to be a specialized and reliable method of identification of the deceased, particularly in multiple fatality incidents. Although this reputation has been gained from the application of forensic odontology in both individual identification as well as disaster situations over a number of years, the professional nature of the discipline and its practices have evolved only recently.

Therefore, success of forensic dentistry can be achieved totally only if the dental specialist and the dental institutions maintain antemortem records of their own patients with information such as name, age, sex, number of teeth present, filled teeth, dentures, and other restorations, morphological

variations of teeth and mucosa with photographs and radiographs. This antemortem record will help to identify deceased persons and criminals by comparing with the postmortem records prepared by examining deceased persons during investigations, in homicide and mass disasters.^[4]

This study was conducted among the dental practitioners to assess their awareness about forensic odontology [Figure 3].^[1] The results show that the knowledge of forensic odontology among the dental practitioners is not adequate (Based on Questionnaires).

Teeth can be used as a weapon of attack or defense. Dentistry has much to offer to law enforcement agencies in the uncovering and solution of crime. The permanent teeth develop throughout the first two decades of life, and physiologic variations, pathologies, and effects of dental therapy may be recorded in the hard tissues of the remaining dentition throughout life and beyond. It is the role of the dentist to help extract this information and use it in the identification of the unknown body.^[5] Human teeth and dental restorations have proven to remain stable during a long time as well as in extreme situations such as fire. Therefore, dentist can play an important part in the identification of severe mutilated bodies of unknown persons. The teeth may also be used as weapon and under certain circumstances, may leave information as to the identity of the biter. Analysis of bite marks is the second major responsibility of the forensic dentist. The dental practitioner has a major role to play in providing them accurate dental records on which much of forensic activity is based.^[3]

Awareness among dental practitioners

There is increased need for dental surgeons to have a good knowledge about forensic odontology as it is useful in identification of an individual and also discover abuse among all ages. Dentists are the health-care professionals who routinely assess the head and neck of the patients and have a great chance in identifying the signs of abuse and neglect. Every dentist has to understand the forensic implications associated with their practice. There is always a lack of involvement among dentists because of lack of training and experience, and due to their limited knowledge in this branch of dentistry. There is also a fear of litigation among dentist which commonly discourages them. "Any physician who fails to identify and report a child with historical, physical and radiological findings that indicate abuse is guilty of professional negligence."^[6] There is always a lack in availability and accuracy of dental records which has a great influence in determining the success of identification.^[7]

The study shows clearly that there is a general lack of practice of forensic odontology among dental practitioners in India. This could be owing to multiple reasons. There are very few institutions offering formal training in

forensic odontology. Most of the practitioners had no formal training. There are no fully equipped laboratories for forensic odontology in India. Forensic odontology was not included as a part of our academic curriculum until recently. There are very few workshop conferences that have been conducted in forensic odontology per year for dental practitioners, which could kindle an interest among the students to probe deeper into the subject.

Conclusions

This condition, however, could be improved if necessary steps are taken to make forensic odontology a part of our course. In addition, periodic conferences and seminars if conducted would help the dental practitioners and students enrich their knowledge about forensic odontology.

Oral pathologists have a major responsibility in the development of this science. The updated current dental curriculum in India includes forensic odontology in the undergraduate and postgraduate syllabus and constitutes a major portion of the subject of oral pathology we conducted a survey to evaluate the scope and limitations of oral pathologist as forensic expert.^[7]

Education

Most Canadian dental schools devote several hours to forensic odontology during the students' last 2 years of school by integrating the subject into their oral pathology courses. The Bureau of Legal Dentistry at the University of British Columbia offers masters and postdoctoral program in the field of forensic odontology. The Bureau is a forensic odontology laboratory and is the first and only laboratory in North America that is dedicated to full-time forensic dentistry research, casework, and graduate teaching. Another excellent source of postgraduate forensic dental training is the Armed Forces Institute of Pathology of Washington, DC, which offers an annual week-long program. The American Academy of Forensic Sciences established the American Board of Forensic Odontology in 1976 and began certifying qualified dentists in the field of forensic odontology.^[8]

The demand for accurate forensic investigation will increase the scope of this interesting science in India. On the basis of the findings of the present survey, we recommend a plan for improvement, which should be implemented in three phases. In the first phase, the undergraduate program must be improved by including preclinical lectures on forensic odontology, followed by clinical training. There must be a detailed program to ensure exposure to forensic cases. Training in forensic medicine and other branches of forensic science should include forensic aspects of dentistry. Teachers need to be trained to teach forensic dentistry.

In the second phase, a structured postgraduate training program should be developed, with significant clinical

exposure to different specialties, especially oral pathology and microbiology. The postgraduate trainee must develop adequate knowledge of proper report presentation to the police department, record keeping and archivization, criminology, legal jurisprudence, use of computers and forensic photography.

In the third phase, we recommend that postgraduate diploma course/certificate course/short-term courses be started in the specialty of forensic dentistry.

We also recommend the establishment of referral centre with well-equipped dental laboratories (at least at the district levels), standardization of techniques and most importantly, improvements in record keeping (e.g., have a standard check of dental records in hospitals and private clinics, issue identification numbers/allot dental or medical identification cards to patients).^[9]

For an efficient forensic investigation, we need a dental team, comprising personnel from all branches of dentistry, working in close association with experts from other branches of forensic science. The government has a social obligation to recover, identify and hand over the remains of a deceased person to the relatives and every effort must be made to achieve this. Academicians, law-enforcing authorities, statutory bodies, and government have to get together and coordinate an action plan.^[10]

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Conflicts of interest

There are no conflicts of interest.

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