

Forensic odontology education: from undergraduate to PhD - a Brazilian experience

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ABSTRACT

Background: Forensic Odontology is a topic present in the majority of Dental Schools in Brazil, and due to this reality, some universities develop activities related to undergraduate and graduate students, from the Dentistry course until the Ph.D. degree.

Aim: To present the education experience related to Forensic Odontology at School of Dentistry of Ribeirão Preto (USP - University of São Paulo), showing the strategies and activities in the different degrees (Dental course, Forensic Odontology Specialization Program, Specific Professional Training, Master, and Ph.D.).

Results: To the undergraduate students, many activities are developed in order to demonstrate all the possibilities that Forensic Dentistry allow, including theoretical and practical activities; in the Forensic Odontology Specialization Program, the dentists are trained to act as Forensic Odontologists in all its amplitude; in the Specific Professional Training, some courses are available, related to specific topics as DVI, Forensic Facial Reconstruction, Auditor in Dental Care Insurance and others; and in the Master and Ph.D. Programs, the professionals receive training in skills like teaching, research, student's guidance and others.

Conclusion: In Brazil, Forensic Odontology is a well-known field in Dentistry and universities develop an important role in training a qualified workforce.

INTRODUCTION

Higher education in all countries is essential in human development and social mobility, not only training specific skills but also become professionals able to act according to ethical precepts.¹

After the Brazilian Decree 3860/2001,² education institutions have to be divided according to their academic organization into: universities, colleges and integrated colleges, institutes and universities, technical education centers. Universities should follow the principle of indivisibility of teaching, research and extension, which differentiates them from other institutional forms of higher education.²

All the Brazilian universities have autonomy to create and arrange courses and graduate programs² and, accordingly, the expressions *lato sensu* and *stricto sensu* were introduced into the

education system to differentiate graduate courses, where *lato sensu* comprises specialization programs and *stricto sensu* are master's and doctoral programs, but in both, open to candidates that concluded an undergraduate course³, and according to the specific area.

In 2001, several higher education programs in Brazil were modified, and Dentistry was not different. National curriculum guidelines in Dentistry are arranged in the Resolution CNE/CES 03/2002 which, in Article 6, paragraph II appears that one of the essential elements for the degree course in Dentistry should be human and social sciences, including knowledge regarding legal and ethical issues, and contemplate the complementary activities that higher education institutions should have, were scientific research and extension programs are placed.⁴

The interest in Forensic Odontology in Brazil⁵ and in the world⁶ is growing, but there is still low workload for the discipline and a small number of qualified professors in this specialty.⁵ Outside the country, one of the main reasons for the lack of knowledge about forensic dentistry discipline is because it is not part of the mandatory content in the curriculum of undergraduate courses in Dentistry, and yet there few graduate courses in this area.⁶

The objective of this research is to prove the educational experience of the Forensic Odontology branch at School of Dentistry of Ribeirão Preto (USP - University of São Paulo), showing the strategies used and the different activities of the different degrees (Dental course, Forensic Odontology Specialization Program, Specific Professional Training, Master, and Ph.D.).

RESULTS

Undergraduation

As recommended by the Pedagogical Political Project⁷ of the Ribeirão Preto Dental School, University of São Paulo, Forensic Dentistry looks for the integral formation of the student by linking education, research and extension. Upon graduation, many activities are designed to show all the possibilities that the Forensic Dentistry offers, including theoretical and practical activities through three different subjects: (1) Bioethics and Professional Ethics, taught in the 1st semester; (2) Dental Law, which takes place in the 8th semester; and (3) Forensic Dentistry, during the 9th semester.

The practical activities developed during the under graduation imply experience in several fields of activity of the dentist at the interface with the legal and forensic activities, (Figure 1) including archaeology and forensic anthropology, where students are placed in front of a situation in which they must carry out digging procedures to search for skeleton remains, and later, compose the anthropological report and perform identification by dental methods. The activity of forensic trauma involves the description of specific lesions, exposed in dental mannequins. In the dental office activity, students must during the semester make all necessary documentations to open a dental office in their cities, as well as a blueprint showing the dental office organization. Continuing the graduation activities description, in the crime scene exercise the students are faced with the reproduction of a crime scene, and should analyze the context and write a report with photos and a hypothesis of what happened.

Graduation

In the *stricto sensu* graduation course, the Forensic Odontology area has master's and PhD students, who receive training in skills like teaching - through seminars, didactic and pedagogical training, as well join the professor in the activities during the Dentistry degree course; Research - supervising scientific research, preparing their theses, writing scientific papers; and Extension - monitoring the expert routine developed in collaboration with the São Paulo State Court, in civil expertise cases and in association with the Legal and Medical Centre in forensic cases involving anthropological examination and human identification in Forensic Dentistry.

In the *lato sensu* graduation course, the Forensic Dentistry specialization aims to form a Forensic Odontology specialist, with extensive theoretical and practical hours, where they receive training and skills to act and work in all fields related to Forensic Dentistry. The practical activities (Figure 2) involve all these different fields allowed in Brazil: civil, criminal, labour and administrative lawsuits, contemplating knowledge in different fields of work: expertise in civil matters, dental records, forensic ballistics, archaeology and forensic anthropology, dental audit, forensic facial reconstruction, forensic genetics, traumatology, thanatology, crime scene investigation, expertise in labour suits, mass disasters, Lawental law and ethics, training of expert services, age

Figure 1: Practical and expository teaching activities carried out in the undergraduate course, USP - Ribeirão Preto Dental School, forensic dentistry area.
 (A) and (B) Images concerning the practice of forensic archaeology.
 (C) Practice of human identification by dental records.
 (D) and (E) Forensic traumatology activity with the production of traumatic injuries in dental mannequins and volunteers.
 (F) Crime scene investigation practice



Figure 2: Practical activities carried out in the Forensic Dentistry Specialization Course, USP - Ribeirão Preto Dental School.
 (A) Age estimation by different dental methods.
 (B) Forensic anthropology practical activity.
 (C) Forensic archaeology.
 (D) Forensic ballistics.
 (E) Practical activity, crime scene investigation.
 (F) Human identification by dental records.



estimation, bite mark, writing reports, documentoscopy, forensic photography, forensic toxicology and many others. This level of training, initiated in 2010, already has about 100 qualified professionals to work in Forensic Dentistry.

Extension program

Related to the university extension program, several activities are developed, always in the interface to other education levels (undergraduate and graduate): 1) Civil and criminal expert routine; 2) Forensic Odontology College Extension Program; 3) Formation Course for Dental Auditor; 4) 3D Digital Forensic Facial Reconstruction Course; and 5) Mass Disaster identification Training Program.

1) The performance of expertise in civil matters takes place in collaboration with several districts of the São Paulo State Court, in which most cases are related to dental malpractice litigation, adding more than 90 records over the last five years. In the criminal court, the action takes place in partnership with the Forensic Anthropology Laboratory of the Centre of Legal Medicine (CEMEL) at USP - Ribeirão Preto Medical School, performing human identification and contributing for forensic anthropology exams.

2) Forensic Odontology College Extension Program has trained over 30 professionals, and this program aims to show the professional activities in the area, living and becoming familiar with a range of experiences. This project includes follow-up activities of the undergraduate courses, participation and contribution in the execution of forensic procedures, preparation of scientific papers and organizing events and activities in the routine of the Forensic Odontology team.

3) The Formation Course for Dental Auditor is offered as an immersion course, with a workload of 48 hours and six-day, which aims to enable the dentist to work in the dental insurance companies. This activity has trained more than 150 dental auditors in ten different groups.

4) The 3D Digital Forensic Facial Reconstruction Course is offered annually as an immersion course (32 hours) during four days, in order to provide training in the practice of computerized facial reconstruction, enabling the student to create three-dimensional models and complete the digital sculpture process using a software. This activity has trained 18 professionals in its editions.

5) The Mass Disaster Victim Identification Training Program is a course conducted in partnership with the Federal Police Department and the National Police Academy, to create official experts trained in Dentistry to act in managing mass disaster. The event, which has two complete editions and more than 40 experts prepared, was previously initiated to comply with the safety requirements of the largest events held in Brazil – the World Cup and the Olympic Games. The training includes a theoretical and practical approach to implementation of INTERPOL protocols for Mass Disaster Victims Identification in all its stages (*antemortem*, *postmortem* and comparison) including the simulation procedures.

DISCUSSION

Undergraduation

Forensic Dentistry is the specialty that aims to research psychic, physical, chemical and biological phenomena that can reach or could have reached a man, alive, dead or bones, and even fragments or traces, resulting partial or total reversible or irreversible injury.⁸

In Brazil, there is no specific law obliging Brazilian universities to implement courses in their curriculum. There are curriculum guidelines that define the professional profile to be reached.

⁴ The national curriculum guidelines, related to Dentistry, defined that the graduate student must have in the constitution of their professional profile an approach to ethical and legal issues acquiring, thus, pristine moral education, together with the technical and scientific backgrounds.^{4,9} Considering that the dental area closely related to these topics (ethical and legal) is Forensic Dentistry, it is possible to see how many Brazilian universities have adapted it in their curriculum in search of a better approach to the content and training of their students.^{8,9} In other parts of the world, such as Norway, Australia, Malaysia, Japan, Nepal and some Latin American countries, even if in a different way, the Forensic Dentistry is also approached in universities, emphasizing its importance in teaching.¹⁰

According to the Resolution CFO-63/2005, the areas of expertise in Forensic Dentistry include human identification, civil, criminal, labour and administrative expertise, forensic thanatology, writing records, reports and opinions, forensic dental traumatology, forensic ballistics, expert routine in living, dead, intact or in fragments,

expertise in related traces, including spots or liquids from the oral cavity or in it, imaging for expert purposes, dental law, professional practice guidance and images exams in forensic purposes.

And, based on the above fields, after a meeting between the Brazilian Association of Dental Education (ABENO) and the Brazilian Association of Forensic Odontology (ABOL), a document was prepared which contained suggestions related to the subject "Teaching in Forensic Dentistry for the undergraduate level", as the hours to be given, period to be carried out, indicating that the content of the course should be divided into two periods, with minimum workload of 60 hours each, the first, Ethics and Law in Dentistry, conducted the onset of clinical disciplines; the second, Forensic Odontology, to be conducted over periods of graduation.¹¹ And in that same document it is suggested that the relevant topics to the specialist in Forensic Dentistry should be lectured: (I) Dental Code of Ethics and Ethical Process Code; (II) Law 5081/66; (III) Professional exercise (legal and illegal); (IV) Professional Liability; (V) Consumer Protection Code and its relationship with Dentistry; (VI) Dental Records; (VII) Professional fees; (VIII) Professional Confidentiality; (IX) Law applied to Dentistry; (X) Opening and installation of dental development in regard to the ethical and legal aspects; (XI) Practical activities relating to the content taught, (XII) Historical evolution of Forensic Dentistry; (XIII) Expert routine; (XIV) Human Identification; (XV) Forensic Traumatology; (XVI) Forensic Thanatology; (XVII) Forensic Anthropology; (XVIII) Labour accidents and diseases in Dentistry; (XIX) Forensic Genetics; (XX) Forensic Ballistics; (XXI) Bite marks; (XXII) Practical activities.¹¹

In the Pedagogical Political Project (USP – School of Dentistry of Ribeirão Preto)⁷ it is possible to find the objectives of all disciplines, as well as a brief table of the same, where it is verified that the disciplines, during the graduation, have the existing considerations in both documents mentioned.⁷⁻⁹

The practical activities during the undergraduate course aim to awake the student interest, allowing experience, even in a simulated way, the above content in the classroom. A similar crime scene practice developed in this school is performed at the São Paulo Dental School (USP) and, according to the authors; the pedagogical

dynamics become the crime scene lesson well remembered for presenting related content with the knowledge acquired throughout the course.¹²

An important aspect of teaching forensic dentistry in undergraduate courses is to enable dentists to assist in forensic investigations if and when the need arises.⁷⁻⁹ It is possible that the professionals are required to work in cases involving human identification by dental confrontation, disaster victim identification, age estimation and criminal cases involving bitemarks.⁹

For Alberti et al.,¹³ the teacher's concern with the work methodology is fundamental for the planning of learning situations that involve the performance of activities that are related to work practice becoming essential at all education levels. Thinking about this improvement in the quality of the teaching-learning process, Forensic Dentistry develops several practical activities in different ways, trying to connect the theoretical content with the field of action of the Forensic Dentist.

Graduation

The existence of *stricto sensu* graduate program linked to this area, has the importance of investing in the training of skilled professionals to work in teaching the disciplines that include this specialty.⁹ The participation of students in teaching, research and extension, as recommended by the pedagogical political project of the Faculty,⁷ seeks to bring the reality of the teaching activity to the day to day of masters and doctoral students and thus acts preparing teachers and professionals who will assume future responsibility for continuing teaching this area.¹¹ Qualified higher education plays an important strategic role in the country's development, institutions and people.

At the same time that the main objective of the training is to act in academic life, it is considered as an opportunity for transformation and a great contribution to professional improvement.¹⁴ However, despite the importance of the masters and PhD candidates, already evidenced previously, degree course in Forensic Dentistry is still little found within the structure of the Faculties of the country.⁹

In addition to the *stricto sensu* activities, there is also a *lato sensu* graduation course that aims to train the future Forensic Odontology specialist. This course seeks the extensive professional

training in order for the professional to work in different fields of knowledge, such as a Forensic Odontologist or Criminal Expert¹⁵ needing, thus, a vast training. Currently, we can find around 600 specialists in Forensic Dentistry in Brazil, and they work in the civil area, as much as in criminal, labour and administrative office, representing a small number in the labour market close to the real needs of the country. Faced with this problem, it is evident the importance of the *lato sensu* graduate programs in Forensic Dentistry, training qualified human resources, able to act and respond to the existing demand in the Brazilian reality.¹⁶

Extension program

Finally, following the constitutional principle of the indissolubility of the three university dimensions,⁷ Forensic Odontology (USP – School of Dentistry of Ribeirão Preto) also develops practical activities, which aim at the professional improvement through university extension programs. These extension programs are, briefly, the interaction between the university and society,¹⁶ which is essential as it puts the human resources inside the Brazilian reality, bringing greater effectiveness in solving community problems.¹⁷ In addition, extension practices are linked directly with the formative education because, in a satisfactorily functional university triad, there is mutual encouragement between its components.^{18,19}

Dental auditor training course

Subsequent to the continuous rise in the number of newly signed contracts in the strictly dental segment, under the health insurance companies market,²⁰ the Dental Auditor Training Course was created in order to generate human resources in this field. Auditing is a traditional inspectional tool that monitors management systems, and when applied to Dentistry, it is a work focused on improving the quality of service, through standards and indicators previously established, making critical and ethical analysis of the provided dental assistance, both in the public (National Audit System - SUS) and the private sector (health insurance providers).²¹ Furthermore, it is a mandatory activity, by law²² as well as the rules of the National Regulatory Agency for Private Health Insurance and Plans (ANS)²³. Additionally, auditing is one of the

expert skills in Forensic Dentistry.⁸ Thus, the professionals become able to work inside the private health insurance companies, which have recently grown significantly in coverage.^{24,25} Similarly, strictly dental health companies, where there is the essential role of the auditor, follows this notorious expansion.²⁶

Civil and criminal expert routine

The growth of malpractice claims for professional liability against dentists in Brazil follows a global trend, registering an increase of over 380% of litigations in 10 years²⁷ and, since the judiciary power does not hold all of the expertise that these lawsuits require, there is the need for the dentist acting as an expert in solving these hindrances.²⁸ Regarding civil and criminal expertise, the objective is to approach the university's technical and scientific resources with judicial and legal demands of these spheres, ensuring the purpose of the extension practice, which is to serve real needs of society.²⁹

3D digital forensic facial reconstruction course

Nowadays, forensic facial reconstructions are a very useful tool in the human identification process, when applying traditional methods are not effective, or when there is little evidence about the deceased's identity. The technique is used in the attempt to create an approximation of the facial appearance of the individual, thus stimulating recognition so that then, in the presence of a suspect, identification is conducted with ease. Software had been dominating increasingly in this ground, making the process more agile, standardized and thus more effective.³⁰ Hence, due to the deficit amidst trained Brazilian experts to execute this technique, the Forensic Odontology (USP – School of Dentistry of Ribeirão Preto) alongside with Ebrafol (Brazilian Team of Forensic Anthropology and Forensic Dentistry), planned to contribute in the training of qualified human resources to implement the forensic facial reconstruction technique through the use of open-source software. Employing this technique at the national criminal forensic institutes brings undoubted benefits to the service provided to the population.

Mass disaster identification training program

Lastly, realizing the lack of education and training in the police forces against unexpected and calamitous events, the Disaster Victim Identification Training Course was the solution found to put together the efforts of the criminal expert teams in Brazil. The Federal Police Department (DPF) and the National Police Academy (NPA), in a partnership with USP – School of Dentistry of Ribeirão Preto, institutes the training course, which introduces the INTERPOL DVI GUIDE Protocol,³¹ a world reference in this type of disaster management. This guide has been applied and perfected on previous experiences, such as the tsunami in Asia (2004); the crash of Air France Flight 447 (2009) and also the earthquake followed by tsunami in Japan (2011), where very satisfactory results were obtained in the identification of victims,³² highlighting the importance of its guidance.

CONCLUSION

In Brazil, Forensic Odontology is a well-known field of Dentistry, and universities play an important role, training and qualifying professionals in this field. Along with the elucidation of the realized activities, it is clear that USP – School of Dentistry of Ribeirão Preto offers a complete training in all different levels within the forensic dentistry scope, ensuring full educational process.

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