Integration of forensic odontology services at the National Institute of Forensic Pathology "Doctor Sergio Sarita Valdez" (Dominican Republic): a report of procedures from 2000 to 2024

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ABSTRACT

Forensic odontology (FO) is grounded in a well-established historical framework, necessitating adherence to minimum standards to ensure quality on an international scale. Nonetheless, these standards frequently fail to account for the considerable variability in challenges, resources, and practices at the national or local levels. The Dominican Republic, the second-largest nation by area after Cuba in the Antilles and the second-largest by population after Haiti, has exhibited one of the highest economic growth rates in Latin America and the Caribbean. However, it also faces complexities and challenges due to population movement and rising crime rates. The enactment of new legislation and the establishment of institutions, such as the National Institute of Forensic Pathology "Doctor Sergio Sarita Valdez" (INPFSS), signify their contributions to the advancement and modernization of the Judiciary and Public Health through service, education, and forensic research. This article presents the work undertaken by the FO department during autopsies conducted at the INPFSS between 2000 and 2024, highlighting the strengths, weaknesses, and opportunities for improvement that the service has identified as challenges, striving to align with global standards while consistently considering local realities and resources. We assert that the FO procedures at the INPFSS are distinctive, at least within the Latin American context, as they genuinely contribute to illustrating not only current practices but also potential enhancements aimed at advancing Dominican forensic work in accordance with global standards.

INTRODUCTION

Forensic odontology (FO), the application of dental science within the legal domain, encompasses several distinct areas: the identification of unidentified remains, bite mark analysis, the interpretation of oral injuries, and dental malpractice.[1] FO possesses a robust historical foundation, exemplified by the International Organization for Forensic Odonto-Stomatology (I.O.F.O.S.), a global entity that fosters goodwill, advancement, and research,[2] and promotes international recognition of FO as a "primary identifier" among the most reliable methods for confirming identity.[3] Nevertheless, while FO procedures should adhere to a minimum standard to ensure quality at an international level, these standards often fail to accommodate the significant variability in problems, resources, and practices

at national or local levels.[4] Solheim (2018) asserts that due to the differences among countries in defining FO, its essential knowledge, and the scope of its field procedures, it is extremely difficult to reach consensus on technical requirements or even on the minimum qualifications for its professionals and expert reports.[5]

The Dominican Republic, situated on the island of Hispaniola within the Greater Antilles of the Caribbean Sea, shares a maritime boundary with Puerto Rico to the east and a land boundary with Haiti to the west, occupying the eastern five-eighths of the island. It ranks as the second-largest nation by area after Cuba in the Antilles and the second-largest by population after Haiti, exhibiting one of the highest economic growth rates in Latin America and the Caribbean.[6] As the most frequented tourist destination in the Caribbean, coupled with its population density and both regular and irregular migration phenomena, the country faces specific challenges necessitating intricate medico-legal strategies.[7] The notable rise in crime, the lack of reliable records, and the sluggishness of criminal proceedings in the courts prompted a series of systemic reforms in the early 2000s, aimed at delivering timely responses despite the limited resources available at that time.[8] The implementation of the Dominican Republic's Criminal Procedure Code in 2002,[9] the approval of the Statute of its Public Ministry in 2003,[10] the enactment of the Institutional Law of the National Police in 2004,[11] and the establishment of the National Institute of Forensic Sciences of the Dominican Republic (INACIF) in 2004 (later formalized by law in 2008[12] collectively signify the substantial transformation experienced by the Dominican criminal justice system. These reforms sought to reduce judicial backlog and bureaucratization, expedite processes, redefine the roles of the actors, and delineate the functions of investigation.[8]

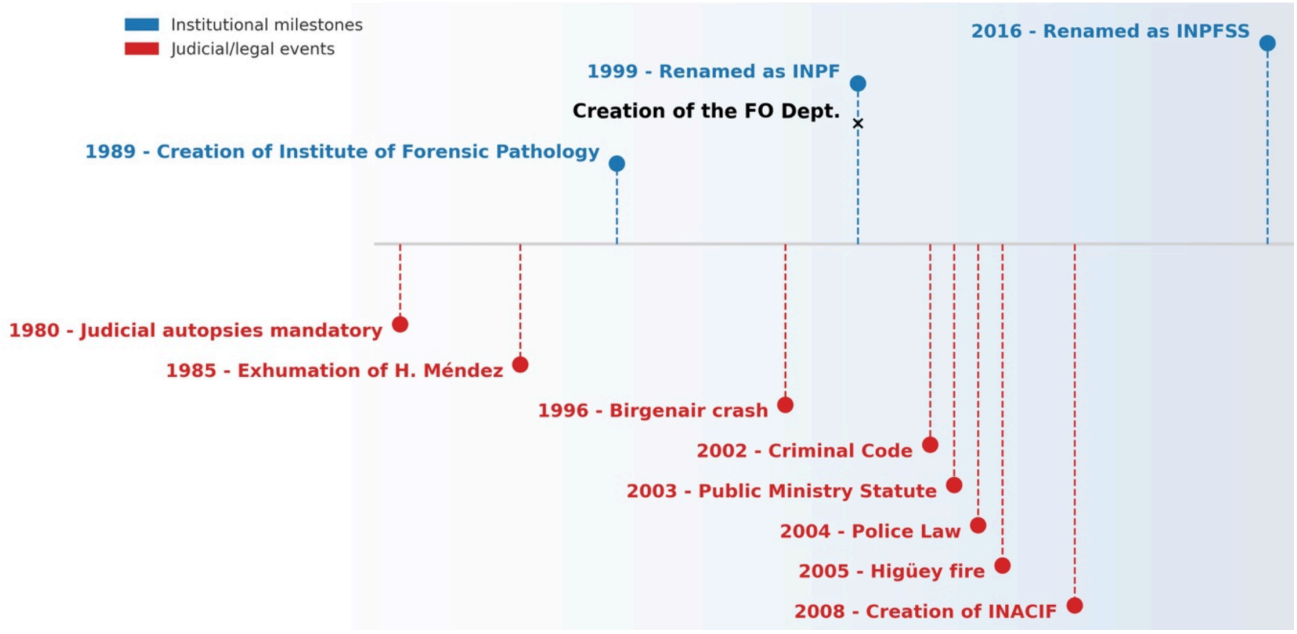
Although Dominican forensic medicine possesses a significant historical foundation,[13] it was not until the implementation of mandatory judicial autopsies in 1980[14] that the formal guidelines for the procedure were clarified, highlighting the necessity for both the procedure itself and the presence of trained forensic pathologists.[15] It has been posited that cases of national importance, such as the murder of currency exchange trader Héctor Méndez in 1985, which necessitated exhumation for further forensic evaluation, underscored the importance of an agency dedicated to such services.[16] In 1989, the Institute of Forensic Pathology *(Instituto de Patología Forense)* was established under the jurisdiction of the Attorney General's Office to conduct judicial autopsies.[17] This institution was renamed the National Institute of Forensic Pathology (INPF) in 1999, reflecting its contributions to the advancement and modernization of the Judiciary and Public Health through service, education, and forensic research.[18] The establishment of INACIF in 2008 introduced new responsibilities for the INPF, although it continued to perform autopsies.[19] In 2016, the INPF was renamed the National Institute of Forensic Pathology "Doctor Sergio Sarita Valdez" (INPFSS) in recognition of the esteemed training, reputation, and contributions of this distinguished Dominican professional and academic.[20] Since that year, the INPFSS has redirected its focus towards conducting autopsies of natural deaths, although it also occasionally supported autopsies of violent deaths or other tasks together with the INACIF.

On February 6, 1996, the crash of Birgenair Flight 301 in Puerto Plata, a municipality in the north of the Dominican Republic, resulted in the tragic loss of 189 lives, predominantly German tourists returning home.[21] This incident also highlighted the absence of Dominican forensic odontologists in the identification process of the victims. Dr. Sergio Sarita Valdez, then director of the INPF, advocated for the integration of these specialists into a dedicated FO department at the institute, which was realized in 1999 (Fig. 1).

This department has been in continuous operation up to the present INPFSS, making significant contributions to public events, such as the fire during a riot at the Higüey prison, which resulted in 133 fatalities.[22] The role of forensic odontologists at the INPFSS has been well-documented, as they participate not only in victim identification but also collaborate in all autopsies during the external examination, thereby enhancing the detection of intraoral evidence.[7] The current staff composition of the INPFSS comprises one director, one deputy director, five coroners, three histopathologists, one pediatrician, two gynecologists, three laboratory technicians, three autopsy room technicians, and five forensic odontologists. Additionally, medical students specializing in forensic pathology engage as residents at the

institute throughout their four-year training period. Each autopsy conducted at the INPFSS, irrespective of whether the cause of death was natural or violent, involved the participation of one coroner, one histopathologist, one forensic odontologist, one fourth-year resident, one third-year resident, two second-year residents, three to four first-year residents, and one autopsy technician. Significantly, a forensic odontologist participated in all autopsies, suggesting that, in addition to conducting specific odonto-stomatological procedures, their involvement facilitates the oversight of the autopsy process as a quality assurance measure. This approach helps prevent the underestimation or omission of oral information pertinent to the determination of the cause of death. The primary aim of this study was to elucidate the work conducted by forensic odontologists during autopsies performed at the INPFSS between 2000 and 2024. It emphasizes the strengths, weaknesses, and opportunities for enhancement that the service has identified as challenges, striving to align with global standards while consistently considering local realities and resources.

Figure 1. An infographic featuring a timeline that encompasses both institutional milestones and significant judicial or legal events within the country. Note the establishment of the FO department in 1999.



MATERIALS AND METHOD

This study conducted a retrospective analysis of all autopsy reports completed at the INPFSS from 2000 to 2024, with particular emphasis on the procedures performed by forensic odontologists during these examinations. Given that the responsibility for conducting autopsies and involving forensic odontologists in these procedures has consistently resided with the institution under examination, this retrospective analysis generically refers to the institution as the "INPFSS". This designation will be maintained throughout the study period from 2000 to 2024, irrespective of any changes to the institution's name, to prevent confusion. Data were systematically recorded using Microsoft Office Excel, and descriptive statistics were presented as numbers (n) and percentages (%). FO procedures were classified into distinct categories based on the US National Academy of Sciences report,[1] with specific modifications: "dental identification" (D-ID), "dental age estimation" (DAE), "bite mark comparison" (BMC), "interpretation of oral injuries" (IOI), "dental malpractice" (DMP), and "miscellaneous" (MISC) (tasks not encompassed by the aforementioned categories). To facilitate data interpretation, each FO procedure was assigned to only one category, specifically the most significant one.

RESULTS

Table 1 presents data on 43,044 autopsies conducted at the INPFSS from 2000 to 2024, with an annual average of 1,721. The year 2003 recorded the highest number of autopsies (2,527), while 2020 recorded the lowest (969).

Despite the absence of records for the years 2000, 2001, 2003, and 2004, a predominance of autopsies for violent deaths over natural deaths was evident until 2015, peaking between 2009 and 2011. This trend reversed in 2016, following the reassignment of roles to the INACIF in accordance with local regulations.

Table 1. General and FO procedures for autopsies conducted at the INPFSS from 2000 to 2024

yrs.	Autopsies			FO procedures							
	Violent deaths	Natural deaths	Total	D-ID	DAE	BMC	IOI	DMP	MISC	Total FO procedures	(%)**
2000	*	*	1850	10			25			35	(1.89)
2001	*	*	1929	5			8			13	(0.67)
2002	1665	470	2135	8	90		12			110	(5.15)
2003	*	*	2527	15	89		25			129	(5.10)
2004	*	*	2253	7			50			57	(2.53)
2005	1247	372	1619	39	113		8			160	(9.88)
2006	1149	428	1577	5	87	1	19			112	(7.10)
2007	1112	464	1576	6	99	3	76		1	185	(11.74)
2008	1234	451	1685	4	205	1	73		7	290	(17.21)
2009	1658	0	1658	3	59	3	10	1	9	85	(5.13)
2010	2038	0	2038	1	29		35		3	68	(3.34)
2011	2263	0	2263	4	118		16			138	(6.10)
2012	1478	97	1575	2	93		25		4	124	(7.87)
2013	824	941	1765		56	3	24		5	88	(4.99)
2014	895	851	1746		31		21		1	53	(3.04)
2015	967	897	1864	2	35		25		4	66	(3.54)
2016	167	1211	1378		10		17	1		28	(1.50)
2017	45	1256	1301	1	2		8		6	17	(1.31)
2018	40	1486	1526		37		3	1	4	45	(2.95)
2019	53	1574	1627		30		4	1	4	39	(2.40)
2020	37	932	969	1	15		6		4	26	(2.68)
2021	68	1226	1294	3	15		7		4	29	(2.24)
2022	71	1238	1309	4	9	2	6		3	24	(1.83)
2023	59	1673	1732		27		8	1	3	39	(2.25)
2024	5	1843	1848	2	6		8			16	(0.87)
		TOTAL	**43,044**	**122**	**1,255**	**13**	**519**	**5**	**62**	**1,976**	**(4.59)**

Notably, INPFSS policies mandate the presence of at least one forensic odontologist at all autopsies conducted at the institute. A total of 1,976 FO procedures, significant for autopsy work, were reported, constituting 4.59% of all autopsies performed. The year 2001 recorded the fewest procedures (13 FO procedures, 0.67% of the total for that year), while 2008 recorded the

most (290 FO procedures, 17.21% of the total for that year), with an average of 79 FO procedures per year.

Table 1 also details the distribution of D-ID, DAE, BMC, IOI, DMP evaluations and MISC throughout the study period. The most frequent FO procedures were DAEs, totaling 1,255 procedures (63.51% of the total FO procedures), with a peak of 205 procedures in 2008 and an average of 50 DAE procedures annually. According to the INPFSS protocol, every unidentified body entering the autopsy undergoes a DAE for record purposes, irrespective of the cause of death or subsequent identification by other means, accounting for the high number of DAE procedures recorded. The second most frequent FO procedure was IOI, with 519 procedures (26.27% of total FO procedures), peaking at 76 procedures in 2007 and averaging 21 IOI procedures annually. It is important to note that the oral injuries assessed by forensic odontologists in this category pertain solely to the cause of death, excluding incidental injuries, which are categorized as MISC.

The third most prevalent FO procedure was D-ID, accounting for 122 procedures (6.17% of the total FO procedures). The majority of these involved the identification of individual cases. A notable peak of 39 D-IDs occurred in 2005, with 30 related to the aforementioned fire during a riot at Higüey prison,[22] and an average of five cases per year. Although not included in these results due to their primary assignment to the INPFSS, the FO department collaborated with the INACIF on D-ID tasks in different media-significant incidents involving multiple victims.[23-25] Concerning BMC procedures, the FO department reported conducting 13 procedures within forensic autopsy contexts, in addition to four BMC procedures on living subjects (not included in the table), in contexts of interpersonal violence and/or child abuse (three in 2009 and one in 2016). Regarding the evaluation of individuals who died from suspected DMP, the FO department reported conducting five procedures: three for Ludwig's angina (2009, 2016, and 2019), one for peritonsillar abscess (2018), and one for pharmacological idiosyncrasy (2023), all resulting from failed dental treatments.

The MISC category (Table 2) encompassed all FO procedures not included in the other categories and was the fourth most common procedure performed by INPFSS forensic odontologists, with 62 procedures (3.13% of the total and an average of 2.5 per year). Among these MISC procedures and during medico-legal autopsies, 23 instances of FO detection and/or evaluation of intraoral foreign materials were noteworthy. Of these, 16 cases were associated with choking and identified as the direct cause of death, predominantly involving “cafe coronary syndrome”. The term "Cafe coronary syndrome," also known as "bolus death," refers to a relatively common occurrence of asphyxia resulting from the obstruction of the upper airways by food. In such cases, an autopsy oral examination is recommended to accurately determine the cause of death.[26] Additionally, there were 7 cases in which foreign materials were incidentally discovered intraorally, which did not directly cause death but were documented as items such as a coin, a bullet, or a package containing drugs. In the context of autopsies related to natural deaths, the recording of 23 cases of incidental oral diseases, which encompass malformative, inflammatory, or infectious conditions associated with the natural cause of death, is significant. Additionally, there were nine further records of Ludwig's angina that were not reported as DMP claims and four instances of oral cancer features. Notably, the participation of INPFSS odontologists in three autopsies for intraoral examination, which subsequently resulted in a COVID-19 diagnosis, underscores adherence to the protocol requiring the involvement of forensic odontologists in all autopsies. This protocol was upheld even during the health crisis owing to the absence of a certified cause of death at the time of the procedure.

Table 2. Annual distribution of MISC procedures.

yrs.	Intraoral foreign materials*	Incidental oral diseases	Ludwig’s angina**	Oral cancer	COVID-19	Total
2007	1					**1**
2008	3	2	2			**7**
2009	9					**9**

2010	3					**3**
2011						
2012	2	2				**4**
2013	3	2				**5**
2014	1					**1**
2015	1	2		1		**4**
2016						
2017		5		1		**6**
2018		3		1		**4**
2019		3	1			**4**
2020			2		2	**4**
2021		1	1	1	1	**4**
2022		1	2			**3**
2023		2	1			**3**
2024						
TOTAL	23	23	9	4	3	**62**

DISCUSSION

While there is a general consensus on the definition of forensic odontology and its primary areas of focus, such as identification,[1] it is important to admit, as Solheim has noted, the significant heterogeneity in these concepts across different countries, despite efforts to standardize them.[5] The Dominican system has endeavored to adapt its resources to local needs, striving to "do more with less"[27] given that Central America and the Caribbean are regions where violence is endemic, and there are substantial social, political, and economic challenges.[28] In 2023, the INPFSS conducted 1,732 autopsies on individuals from 51 different countries. This statistic underscores the significant demands placed on Dominican forensic services, which are exacerbated by the substantial influx of tourists and illegal migrants, as previously mentioned in this study. These circumstances necessitate diplomatic procedures for document management. Pachar Lucio asserts that the advancement of forensic institutions is hindered by a lack of official support, inadequate state budget allocations, and, with few exceptions, the absence of specialized forensic professional training and the acquisition or application of modern technologies.[28] From a FO perspective, it has been observed that Latin America has sufficient local issues to address without importing foreign problems and solutions.[29] Consequently, the Dominican Republic, far from seeing the situation on a positive side of things, "a glass half full" situation, and "despite more than forty years of dedicated efforts," still views itself as "far from guaranteeing basic forensic services." These words were spoken in June 2025 by Dr. Sarita Valdez, whose name is honored by the INPFSS.[30]

However, this report of the FO procedures carried out at the INPFSS highlights a distinctive quality over other services: the participation of a forensic odontologist in all autopsies, thereby enhancing the recovery of evidence and assisting the coroner in making diagnoses during external examination. This has rarely been reported, and is almost an anomaly in the functioning of systems globally. This report illustrates that a primary responsibility of the FO department is the implementation of internal protocols for DAE on all unidentified bodies undergoing autopsy. Given that every unidentified corpse undergoing autopsy is subjected to DAE for registration purposes, the opportunity to obtain potentially identifying information—even before antemortem data can be found—is a distinct advantage made possible by the presence of a forensic odontologist working alongside the coroner during all autopsies. The 1,255 DAE procedures conducted during the study period

reflect a noteworthy institutional decision, aligning with contemporary trends in FO research.[31] Moreover, the noted population heterogeneity, influenced by external factors, poses challenges to the global and multicenter validation of DAE methods, an area in which the FO department has already achieved considerable advancements.[32]

It has already been mentioned that there are few reports, research, and publications dedicated to the study of oral signs in medico-legal autopsy contexts, either due to the absence of individuals trained in their interpretation or due to the real lack of interdisciplinary procedures, which could mean that forensic odontology "is underestimated, and its role in the analysis of oral signs during all medico-legal autopsies is not currently considered".[33] Since 2016, the responsibilities of INPFSS forensic odontologists have increasingly encompassed the performance of autopsies for natural deaths, although not exclusively. This transition has facilitated the identification of new competencies and roles, particularly in the collection of oral evidence that would otherwise remain inaccessible. To the best of our knowledge, forensic odontologists are not typically involved in the detection, evaluation, or analysis of intraoral foreign materials during medico-legal autopsies. However, they could initially assume this role during the external examination of the corpse, with the material still in situ, to obtain potentially significant information for the investigation, even in instances where the material may not have been the direct cause of death. This report specifically highlights the 23 procedures in which these intraoral foreign materials were evaluated by the FO department of the INPFSS, in accordance with recommendations in the literature[34,35] to ensure the requisite quality of autopsy procedures.[36] We propose that this line of work be explored in greater depth through formal research in the future.

In the realm of medico-legal autopsies, the IOI aligns with the evolving role of the forensic odontologist, as previously advocated in the literature.[33] The INPFSS further extends this emphasis by highlighting the significance of this role in autopsies for natural deaths conducted at the institution. Table 2 presents the various FO involvements of the INPFSS in documenting oral diseases, which in some instances were incidental, while in others were crucial for establishing or confirming neoplastic diagnostic conditions (tongue cancer in 2015, larynx in 2017, hard palate in 2018, and cheek in 2021). Additionally, in 2018, the FO department conducted a postmortem evaluation of a fatal case of peritonsillar abscess, and between 2008 and 2023, forensic odontologists assessed 12 fatal cases of Ludwig's angina, three of which were attributed to reports of dental negligence. In 2023, the FO department also evaluated a fatal case of pharmacological idiosyncrasy, reported as dental malpractice, following the administration of anesthetics for third molar extraction in a 19-year-old victim. It is well recognized that all these conditions can originate from dental care and are considered rare in contemporary forensic reports.[37-39] While these cases acknowledge potential dental origins, necessitating further investigation into the decedent's clinical history prior to death,[40-42] autopsy reports involving odontologists remain exceedingly rare.[43]

Unfortunately, it is impossible to ignore local, financial, and even political circumstances that can affect both the structure and functioning of the INPFSS,[19] elements that have already been mentioned as determining factors for the stability of any forensic system.[27] Undoubtedly, the indistinct boundaries between the INPFSS's autopsies of natural and violent deaths, as well as the potential overlapping functions between the INPFSS and the INACIF, may result in confusion or complicate the comparison of these data with those provided by other services in Latin America or globally; however, the medico-legal autopsy may also be required in cases of non-violent deaths but with relevance due to the illicit or negligent conduct of third parties and that, obeying the current regulations of the country in question, the techniques must ultimately be adapted to the local needs of their forensic pathologists.[44] It is essential to underscore the significance of conducting a thorough external examination by systematically documenting any form of injury or abrasion prior to undertaking the internal examination. Furthermore, an interdisciplinary approach should be deemed obligatory in all autopsy procedures.[44] The inclusion of forensic odontologists in all INPFSS autopsies has been shown not only to complement the coroner's report of the cause and mechanism of death but also to contribute to enhancing communication between forensic experts and pathologists and

thus to improving the quality of autopsies and their reports, in line with the emphatic suggestions made by the literature.[36,45] The involvement of forensic odontologists during the external examination of autopsies may be crucial for several reasons: they can inspect intraoral characteristics that might indicate the cause of death, evaluate the intraoral presence of foreign materials, irrespective of their role in causing death, identify and evaluate the fit of dislodged dental devices and their role in any oral injuries, and verify the original position of a dislodged tooth along with the likely reason for its detachment, such as blunt force, intubation, or an existing pathological issue. Additionally, they can determine the type of missing tooth when only a bloody socket is visible, aiding investigators at the scene in differentiating intraoral trauma and sometimes assisting in reconstructing the events leading to the trauma. They also identified incidental oral pathologies (as seen in this report), which could be valuable in establishing identity, determining antemortem clinical behavior, or simply providing a complete evaluation in any type of autopsy. As highlighted, the responsibilities of a forensic odontologist during a medico-legal autopsy should extend beyond merely identifying an unknown individual. They should also include assessing any morphological features of the oral cavity, both internal and external, that could shed light on the cause of death.[33,35]

Since 2000, the FO Department of the INPFSS has been involved in all autopsies conducted at its facilities. It is essential to recognize the department's additional significant contributions to the Dominican system, which, although not detailed in this report, are of great importance. Upon the request of the prosecutor's office, the FO Department routinely conducts assessments of living individuals for DAE procedures in various penal cases and evaluates bite mark evidence in instances of child abuse, mistreatment, and domestic violence. Furthermore, the INPFSS and the INACIF have collaborated on numerous victim identification cases that have garnered substantial media attention.[23-25] Given the Caribbean's distinctive population history, and the numerous archaeological sites in the Dominican Republic, dental anthropology work has also been addressed by INPFSS forensic odontologists.[46-48] In terms of research, the FO department has engaged in various projects focused on DAE, either as part of multicenter studies,[32] or by validating them in Dominican populations,[49] as well as in redefining forensic dental work during medico-legal autopsies.[7,50] The FO department currently offers regular instruction in both undergraduate and graduate programs in the disciplines of dentistry and law across several institutions, with both national and international reach.[51] Additionally, it maintains a robust relationship with the media [52,53] and recognized scientific societies. In 2024, in response to the evident need to enhance the facilities of the INPFSS to accommodate this demanding repositioning, the remodeling and expansion of the Institute were inaugurated with the aim of modernizing and facilitating the study and delivery of corpses.[54]

This report highlights both achievements and challenges. It has been noted that Latin American FO is often characterized by complexity, self-sufficiency (in the less favorable sense), and isolation from global standards.[29] However, it is also recognized for its significant progress, pursuit of international collaboration, and promotion of quality assurance in its protocols and evaluations.[55] The I.O.F.O.S. asserts that "quality assurance should never be static", emphasizing that staying updated with scientific advances and practices can address "the huge variability of approaches at the international level or the differences of caseworks in these wide fields of forensic odontology".[4] We consider this report on 25 years of FO procedures at the INPFSS to be unique, at least within the Latin American context, as it genuinely contributes to demonstrating not only current practices but also potential improvements aimed at enhancing Dominican forensic work "to promote goodwill, advancement, and research in forensic odontology".[2]

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