

## **Forensic Dental Education and Training in Singapore - An Evolution Over the Past Two Decades**

### *Introduction*

Over a span of twenty-three years, this author<sup>1</sup> has seen and participated in the evolution of the teaching of Forensic Odontology (*a.k.a* Forensic Dentistry) in Singapore, as well as the gradual growth in the number of local Forensic Odontologists from one individual to, at the point of writing, three people.

The aim of this paper is to describe the origin and evolution of the education (including descriptions of the content and conduct of these training programs), the impetus for training in this niche area, and the future of forensic odontological education in Singapore. The author hopes that this paper may be of interest to like-minded colleagues in other countries that are also growing their own in-house forensic dental capabilities.

### *The author's personal journey in Forensic Odontology*

When the author was an undergraduate dental student at the National University of Singapore (NUS, which is the only dental school in Singapore), from 2001 to 2005, he recalls that there was only one formal lecture in the entire curriculum on Forensic Odontology (*i.e.* one that was pre-planned in the curriculum, and which the students were required to attend) that took place at the final module ('*General Practice Module*') before seating for the final professional examinations. This was a one-hour lecture given by an Oral Maxillofacial Surgeon (who, to the best of the author's knowledge, did not have any formal postgraduate qualifications in Forensic Odontology<sup>2</sup>).

Ironically the author's first exposure to Forensic Odontology was not this formal lecture but an ad-hoc lunchtime presentation that took place one year before. The word ad-hoc is used to mean that it may not have been deliberately planned as part of the curriculum but

was organized perhaps opportunistically and therefore attendance was entirely voluntary. An alumnus of NUS (Dr. Chiam Sher-Lin), who was at that time pursuing her Postgraduate Diploma in Forensic Odontology at the University of Adelaide, Australia, had taken time off her postgraduate training to assist at the Disaster Victim Identification (DVI) efforts in the aftermath of the 2005 Boxing Day tsunami in Phuket, Thailand. Her talk was based on her recent DVI experience in Phuket, and what seeded the author's interest in Forensic Odontology. After that talk, the author learned of the importance of ante-mortem dental records in forensic identification, and he handed over the dental records and treatment notes of a patient of his to the dental school authorities. This particular patient had casually remarked to the author that he was going to holiday in Phuket, but was not heard from again after the tsunami, and therefore the author feared that he may have been one of the tsunami's many victims.

After the author graduated from dental school and qualified as a dentist, he scanned the horizon for presentations, courses, symposiums, and workshops in Forensic Odontology; but there were none in Singapore that was openly available to the public. This, in turn, meant that if any Singaporean dentist was interested in pursuing either a formal postgraduate qualification or short course or workshop in Forensic Odontology, he/she had to do so overseas. This was precisely the path that the author took by first attending a four-day '*Forensic Odontology and Anthropology*' workshop at the New South Wales Institute of Forensic Medicine (Sydney, Australia) and later volunteered for a couple of months at the mortuary in Sydney to assist a Consultant-grade Forensic Odontologist. These experiences in Sydney (where the author was at that time pursuing his specialty training in Dental Public Health) confirmed that Forensic Odontology was indeed another dental discipline that the author would like to specialize in. Several years later, the author pursued a Masters in Forensic Odontology (MFOdont) from the University of Dundee, UK (under the sponsorship of his employer, the Singapore Armed Forces).

Since then the author has continued his professional education at various civilian and military institutions around the world, including but not limited to, the Victorian Institute of Forensic Medicine (Melbourne, Australia); the Center for Education and Research in Forensics (San Antonio, US); the Norwegian Armed Forces Joint Medical Services (Oslo, Norway); and a workshop that was jointly organized by the Malaysian Armed Forces, Royal Bruneian Armed Forces, New Zealand Defence Force, and Netherlands Armed Forces (Kuala Lumpur, Malaysia).

The collective knowledge and experiences gleaned from attending these conferences, courses, and workshops served to further the author's own growth in Forensic

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<sup>1</sup> The author is a Consultant in Forensic Odontology at the Singapore Armed Forces Medical Corps (where he is serving as an active-duty uniformed Dental Officer), and concurrently a Visiting Consultant Forensic Odontologist at the Forensic Medicine Division, Health Sciences Authority.

<sup>2</sup>At that time, there was already one Forensic Odontologist in Singapore (Dr. Tan Peng Hui), it was unclear then and now why Dr. Tan was not the one who gave this lecture to the author's class, because Dr. Tan did deliver this lecture for subsequent batches. This was followed by the author doing likewise for more recent cohorts.

Odontological knowledge and practical experience. More importantly these gave the author the opportunities to personally experience how these continuing professional activities were designed, organized, and executed so that he could in time develop something similar for Singapore.

#### *Singapore's approach to improving DVI capabilities*

The objective of establishing Forensic Odontology courses and workshops locally in Singapore is to develop a sustainable long-term pipeline in Forensic Odontology to improve Singapore's DVI capabilities in the aftermath of mass fatality incidents (MFI). To achieve this objective, Singapore adopted a two-pronged approach. The first approach is to raise more Forensic Odontologists, and the second is to raise and train dentists (both generalists and specialists) and oral health therapists<sup>3</sup> in the principles of forensic dental identification to a sufficient level to assist Forensic Odontologists in the event of a DVI in Singapore.

The difference between these two groups are as follows: the former (Forensic Odontologists) have undergone a formal postgraduate qualification in Forensic Odontology and can therefore be (i) consulted by Forensic Pathologists to provide forensic dental input in coronial death investigations (such as to identify unknown human remains and undertake dental age estimations), and (ii) conduct ante-mortem and post-mortem examinations and reconciliation (and are in turn qualified to sign off on the INTERPOL's DVI forms and sit on the DVI reconciliation board). As a former British colony, Singapore applied English law from the outset, substantively and formally (*i.e.* Common Law), and therefore her Coroner system<sup>4</sup> is also similar to that of England's (1). The latter group (styled 'forensically trained dentists') are trained not through formal postgraduate qualifications but via continuing professional education courses (of varying duration from days to a full week). These 'forensically trained dentists' would be activated by the Singapore Police Force, through the Health Sciences Authority, in the event of a MFI in Singapore; and their roles in DVI are to assist Forensic Odontologists.

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<sup>3</sup>The Oral Health Therapist in Singapore is an allied dental healthcare professional who performs the fused dual roles of dental hygiene (in children and adults) and dental therapy (to perform basic primary dental work in children).

<sup>4</sup>The Coroner is a judicial officer of the State Courts of Singapore appointed by the President of Singapore on the recommendation of the Chief Justice to perform the functions and duties, as well as to exercise the powers conferred by the Coroners Act (Cap. 63A).

The distinction between both groups (Forensic Odontologists versus 'forensically trained dentists') is necessary because there is a substantive difference in the amount of time and specialist knowledge that can be taught (and learnt) during a postgraduate qualification versus a course/workshop/symposium that spans a few days to one week long<sup>5</sup>.

In order to raise more Forensic Odontologists, a multi-disciplinary team (which included the author as the sole dentist on the team) advocated for and worked towards the establishment of a national government funded scholarship to sponsor Singaporean dentists to pursue a Master's degree overseas. At the point of writing, the destination of tertiary studies for the Health Sciences Authority (HSA) Forensic Odontology Scholarship is the University of Dundee in Scotland, UK<sup>6</sup>.

There were two notable points about the HSA Forensic Odontology Scholarship. First the funding for this scholarship was approved during 2020 (this is notable because this was the first year of the COVID-19 pandemic and the government had presumably re-prioritized the budget to tackling COVID-19). Secondly, until very recently, the Singapore Armed Forces (SAF) was the only public institution to raise Forensic Odontologists. As such, the SAF Forensic Odontologists are also called upon to support the Nation's requirements (2).

With regards to the second prong to raise and train 'forensically trained dentists', this is necessary because until the creation of the HSA Forensic Odontology Scholarship, there were only two qualified Forensic Odontologists (Dr. Tan Peng Hui and the author) practicing locally<sup>7</sup>. This number is grossly inadequate to

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<sup>5</sup>In some countries, dentists who have undergone continuing professional education courses in Forensic Odontology are deemed to be trained Forensic Odontologists. In these jurisdictions there do not appear to be a distinction between those who have obtained a formal postgraduate qualification versus those who have only undergone continuing professional education. Singapore's approach is therefore probably novel in distinguishing between both groups.

<sup>6</sup>The University of Dundee is one of a handful of universities in the world to offer postgraduate degrees in Forensic Odontology. The University of Dundee was selected over the other alternatives because of its strong emphasis on DVI, practical experience in actual post-mortem dental identification casework at a working mortuary, overall cost effectiveness, and appropriate course duration.

<sup>7</sup>Dr. Chiam Sher-Lin who gave the lunchtime talk on her DVI experiences in Phuket had migrated to Canberra, Australia, where she practices as the only Forensic Odontologist in Canberra, the capital of Australia.

support the national DVI requirements. At the same time, given the relatively small incidence of ‘peacetime’ coronial death investigations that required odontological input, there was a limit to how many Forensic Odontologists that could be sustained by the workload. Hence, the need to tap on the wider pool of dentists (and even oral health therapists) to be activated only in the event of surge requirements (*i.e.* a MFI happening locally). For Singapore’s humanitarian assistance and disaster relief efforts to support regional and international DVI missions, the plan remains to deploy Forensic Odontologists (2,3). The next section of this paper discusses the education and training of these ‘forensically-trained dentists’.

*Educating forensically-trained dentists in Singapore*

The first Forensic Odontology course in Singapore was organized by the author and Dr. Tan Peng Hui in August 2016 and was pitched at undergraduate dental students training to be dentists. The ‘*Forensic Dentistry workshop*’ was organized as part of the 2016 Asia Pacific Dental Students’ Association (APDSA) Congress, that was hosted in Singapore that year. The workshop comprised a lecture followed by a practical demonstration on facial dissection technique using anatomical cadaveric teaching bodies at the Yong Loo Lin School of Medicine, National University of Singapore (Figure 1). This workshop was pitched by the conference organizers (dental students at NUS) as an “eye-opener to provide dental students useful training and a rare experience in dental forensics.”



**Figure 1** The author (with the support of Dr. Tan Peng Hui and a Forensic Technician from HSA) demonstrating a mandibular (lower jaw) resection at the anatomy hall of the National University of Singapore

This was followed a few months later in November 2016, when the author organized the inaugural forensic dental course for dentists in Singapore under the auspices of the Forensic Medicine Division, Health Sciences Authority<sup>8</sup> (HSA). This course titled the ‘*Introduction to Forensic Dentistry in Disaster Victim Identification*’ was a half-day program comprising lectures only and was designed for dentists and oral health therapists who were interested in learning about the role of dentistry in DVI. This course introduced participants to an overview of forensic human identification during MFIs, the scope and principles of forensic dental identification, and the role that ‘forensically-trained’ dentists and oral health therapists can play during DVI efforts. The program schedule is shown in **Table 1**. Close to eighty dentists and oral health therapists turned up for this course, which perhaps signaled a pent-up demand for Forensic Odontological continuing professional education amongst the dental profession in Singapore.

**Table 1** Program schedule of HSA’s inaugural Forensic Odontology course in Singapore, Nov 2016

Title of Lecture	Time
Introduction to HSA & Course Opening	15 mins
Introduction to the Course and Forensic Dentistry (Including the history and scope of Forensic Dentistry)	30 mins
Overview of Forensic Human Identification and Disaster Victim Identification (Including Interpol Standards of identification) <i>[Note: this lecture was delivered by a Consultant Forensic Pathologist to highlight how Forensic Odontology fits with the other forensic specialties within DVI operations]</i>	45mins
Principles of Forensic Dentistry (At the scene, Ante-mortem records, Post-mortem examination, Reconciliation)	1h 15mins
Questions and Answers (Q&A) session	30mins

This was followed by another course in January 2017, this time under the auspices of the Singapore Armed Forces (SAF) Medical Corps, when the author organized the ‘*Oral Maxillofacial Trauma and Forensic Dentistry Symposium*’. This course was open to active-duty and reservist (uniformed) SAF Dental Officers and Oral Maxillofacial Surgeons only. The symposium was

<sup>8</sup>In Singapore, there is only one mortuary for coronial death investigations and it is operated by the Forensic Medicine Division, Health Sciences Authority.

crucial in sustaining the SAF’s operational dental capabilities by training Dental Officers to: (i) manage injuries to the head and neck region, and (ii) assist Forensic Odontologists during forensic identification operational efforts. The participants performed simulated forensic dental examination on human cadaveric teaching specimens (**Figure 2**) provided by the Otolaryngology (ENT) Department at Khoo Teck Phuat Hospital (a civilian tertiary-level hospital). Khoo Teck Phuat Hospital was very generous in loaning the teaching materials to the SAF Medical Corps, and there were sufficient materials to allow a very optimal ratio of two course participants per cadaveric head.



**Figure 2** Hands-on using human cadaveric teaching specimens at the SAF’s 2017 ‘Oral Maxillofacial Trauma and Forensic Dentistry Symposium’

The author together with Dr. Dennis Heng (who was the first recipient of the HSA Forensic Odontology Scholarship), the Forensic Medicine Division, HSA, and SAF Medical Corps jointly ran a fourth course. The ‘Introduction to DVI’ workshop took place over the course of three Saturdays from February to March 2024 and cover five modules (see **Table 2** for the program schedule). The objectives of this workshop were to (i) familiarize dental healthcare professionals with the roles and responsibilities that may need to be fulfilled in the event of DVI, (ii) familiarize course participants with DVI workflows in accordance with INTERPOL guidelines, and (iii) to teach the participants the KMD PlassData DVI software. This was the first local continuing professional forensic dental course where the participants were assessed to ensure that they have indeed learnt from the course.

**Table 2** Program schedule of the ‘Introduction to DVI’ workshop, Feb - Mar 2024

Title of Lecture and Hands-On Sessions	Time
Session #1	
Introductory Lecture to DVI (includes an introduction by a Consultant Forensic Pathologist)	1 hour
[Lecture] Dental Photography and Radiography in the DVI setting	30 mins
[Hands-On] Practice with Dental Photography and Use of NOMAD x-ray Machine	1.5 hour
Session #2	
[Lecture] Introduction to Post-Mortem Evidence	30 mins
[Lecture] Introduction to KMD PlassData DVI and Terminology	30 mins
[Hands-On] Practice Exercises in Post-Mortem Dental Identification	2 hours
Session #3	
[Lecture] Introduction to Ante-Mortem Evidence	30 mins
[Hands-On] Practice Exercises in Compiling Ante-Mortem Evidence	2 hours
Session #4	
[Lecture] Revision on Using KMD PlassData DVI	30 mins
[Lecture] Roles and responsibilities in a DVI setting	1 hour
[Hands-On] Practice Exercises in Reconciliation	2 hours
Session #5	
[Practical] DVI Assessment Exercise	2 hours
Overall Course Review & Feedback, Handling out Certificates of Completion to Participants	30 mins

Of note, all of these Forensic Odontology courses to raise and train ‘forensically trained dentists’ were offered at no charge by the HSA and SAF Medical Corps because of ‘national service’ to improve Singapore’s DVI capabilities and resiliency in the event of MFIs. This also has the advantage of removing any financial barriers for participants to attend continuing professional education courses.

*Conclusion: the future of Forensic Odontological education in Singapore*

This author opines that even as Singapore raises more Forensic Odontologists, whether it is through the HSA Forensic Odontology Scholarship for the civilian sector, or the SAF Postgraduate Scholarship for the military<sup>9</sup>, there will still be a need to train ‘forensically trained dentists’. Such future training courses are envisioned to be evolutions of the earlier courses, lectures, and workshops to retain what worked well, and refine the areas that can be improved. Continued professional training is also needful as scientific and technological advancements develop in Forensic Odontology. For a core group of ‘forensically trained dentists’, who are committed to be on the HSA’s activation list in the event of local MFIs, regular refresher training and recertification of competency will also be required.

With regards to raising Forensic Odontologists, the author will not rule out the possibility that the Faculty of Dentistry at the National University of Singapore may one day develop and operate a full-time Postgraduate Diploma or even Masters degree in Forensic Odontology. However, the author is of the opinion that this is very unlikely to happen and even if it does it will be many years in the future. What is more plausible though, is the creation of Fellowships in Forensic Odontology that are conducted part-time to allow participants to continue working full-time whilst gaining theoretical and practical experience at the Forensic Medicine Division, HSA, and taught by a faculty of Forensic Odontologists who are drawn from the public and private sectors, and the SAF Medical Corps.

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<sup>9</sup>Both Dr. Tan Peng Hui and the author were sponsored by SAF to undertake their Forensic Odontology postgraduate qualifications. Dr. Tan did a Postgraduate Diploma at the University of Melbourne, Australia, and the author studied a Masters degree at the University of Dundee, UK.