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Contents

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EDITORIAL

SRI LANKA POLICE SERVICE, A FORCE TO BE RECKONED WITH PRIDE; VIEW OF A FORENSIC PATHOLOGIST.

The Forensic Pathologists of Sri Lanka work very closely with the police for the administration of justice. The police act as one of the main pillars in the medico-legal system of Sri Lanka. The police service should be recognized as the hub of criminal investigations pertaining to both the living and the dead. This letter is written in the context of how the police can better utilize the services of a Forensic Pathologist who also attends to clinical cases as a Judicial Medical Officer.

In Sri Lanka the Forensic Pathologist who also works as a Judicial Medical Officer covering clinical cases of forensic significance may be the first contact in most cases following an issuance of a Medico Legal Examination form (MLEF). In all instances the police may not be present at the time of examination but in situations such as a victim of a sexual assault, child abuse and examination for intoxication a suspect to be kept in police custody especially in the nights where the police always accompany the individual. It is of paramount importance that the accompanying police officer understands what the Judicial Medical Officer is trying to communicate regarding the findings such as an attenuated hymen as a result of repeated vaginal penetration, stretchable hymen which can accommodate an adult penis without sustaining any injuries and cases of alcohol intoxication complicated with natural pathology. This is equally true for the police officers who present themselves for complicated autopsies with potential medico-legal issues. Though the Judicial Medical Officer is supposed to talk in simple layman language, there still can be instances where the exact lay term may not be available as mentioned above. The police officer, again in most cases acts as a link to the Attorney General's department. The understanding of information written and spoken is very vital for the administration of justice. Srilankan police officers with excellent literacy rate should be made familiar with the terms the Judicial Medical Officers use when examining and reporting on clinical forensic cases. This can be achieved by training police officers of excellence who will have commendable communication skills, reasonable knowledge in medical terminology and high calibre investigating skills. These police officers would be an asset to the medical forensic community where they can discuss matters of highest confidentiality while the personal integrity of a practicing forensic physician is preserved. In a complex homicide where the cause of death could not be ascertained on the first instance but needs detailed investigations and more information from other categories of forensic professionals to conclude the case then the role of the police officer would be really valued. These are not expectations which cannot be met. The Judicial Medical Officers would whole-heartedly support the Sri Lanka Police Force to emerge as a regional giant equipped with high calibre police personnel. One recommendation the writers would suggest to make is that more and more young and qualified police officers be encouraged by the Police Department to follow forensic-based short courses conducted by the local universities.

The same is applicable when it comes to the investigation of deaths. In high profile cases, the police may have to deal with several agencies including Attorney General's department, Government Analyst's department, Office of the JMO etc. Here again, the police officer's role is outstanding and unique in the sense that the confidential information need to be shared and any new information need to be properly

communicated among the concerned parties. Therefore the police officer who may be wishfully called as '*police detective'* is respected as an officer of excellence with high practicing skills and sound knowledge in investigation. The Forensic Pathologists practicing in Sri Lanka would never hesitate to share their knowledge in building up a highly professional Police Service for the benefit of the criminal justice system of the country.

The Scene of Crime Officers (SOCO) as a unit is praiseworthy. Their services are often unchallengeable and in par with those of any developed country. This is based on the experiences the writers had during their exposure to forensic services in developed countries. The writers would like to stress that their experiences are in anyway **not i**nferior to Crime Scene Investigation (CSI) officers of any other country and infact they are more equipped to share their unique experiences with their colleagues in different parts of the world where mass-disasters, underworld killings, bomb explosions, rifled firearm deaths and exhumations of mass-graves are a real forensic rarity. This assertion is again made with relevant to the first hand experiences the writers had during their stay in developed countries. It is the writers desire to conduct research on SOCO performances and enlighten the Sri Lankan public in coming years. They have so far handled several challenging cases of note as witnessed by the authors. The Forensic Pathologists would like to see them emerge as a task force well equipped with all the facilities and a well sought-after companion in high profile cases.

The Forensic Pathologist's role in conducting investigations regarding victims of road traffic injuries is often minimal. Since Traffic Medicine as a different entity is not yet well practiced among forensic practitioners of the present-day, many an information where a forensic pathologist can provide is not sought after. When there is a firm requirement from the investigating police officers, the forensic pathologists would also gear themselves up to provide that information.

At the end of the day from the authors' point of view, a police officer who is well trained and knowledgeable, well equipped with the current trends and who can work with a Forensic specialist with utmost confidentiality, trust and personal integrity is a real asset. Thus in future Sri Lanka, we all can be proud as a nation with a high calibre and outstanding police force acting as the main pillar in the criminal justice system.

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ATYPICAL FIRE ARM INJURY

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ABSTRACT

There are many case reports of atypical firearm injuries but unexpected direction of the gunfire is found rarely. It is indeed a rare finding that a bullet passes from inguinal area along the length of the thigh without damaging the overlying trouser at the entry. The most important issue in such instance is to decide the manner of death.

A body of a young person was found with bleeding injuries in the abdomen and was confirmed dead on admission to a tertiary hospital. In his right groin, beneath the intact denim trouser, there was a firearm entry wound with burnt margins. The tract was directing downward, inwards and backwards, lacerating the right femoral blood vessels, and exited through a split, at the inner side of right knee with corresponding damage to the trouser. The deceased also had multiple, parallel and superficial scars on the inner aspect of his left hand.

Though he had self-inflicted scars, the site and the direction of the firearm injuries were not elective of suicide.

Attain this direction of fire, without inflicting damage to the overlying garments at the entry is highly unlikely in a homicide.

Carrying the gun under the waist of the trouser is not uncommon and in this case, the gun would have fired accidentally possibly while pulling it out. This conclusion was further confirmed by the absence of damages on the overlying trouser at the entry wound and the unusual longitudinal direction of the tract in the thigh. The most probable manner of death was accidental.

INTRODUCTION

Typical gunshot injury consists of entry, tract and exit wounds. Several authors have reported fatal cases of rifled firearm injuries showing multiple variations from common findings. Reports of firearm-related deaths with unusual wound sites enrich forensic practice, providing additional data for interpretation of findings[1]. The deviation from term 'typical' could be usually due to characters of the gun, bullet or intermediate objects[2]. There are many case reports of atypical firearm injuries, but unexpected direction of the gunfire within the target is found rarely. It is indeed a rare finding that a bullet's trajectory passes from inguinal area along the length of the thigh without damaging the overlying trouser at the entry wound. We present one such case of gunshot injury to the thigh. The most important issue in such instance is to decide the manner of death.

CASE REPORT

A body of a young person was found in front of a boutique with bleeding injuries in the abdomen and was confirmed dead on admission to a tertiary hospital.

Eye witnesses were not available. The police informed that the deceased was a member of an 'underworld gang' and a weapon was not available at the scene.

On examination, beneath the intact denim trouser (upper arrow in figure 01), there was an oval shape, 1.5 x 1cm, perforated laceration at the right groin. The margins were burnt and blackened. When cleaned the wound, a rim of haemorrhage around the margin was evident (figure 02). The tract was 1.5cm in diameter and 34 cm long and it was filled with blood. The tract was directed downwards, slightly inwards and backwards, lacerating the right femoral blood vessels (figure 03), and ended as a split, 1.5 cm x 0.5cm, at the inner side of right knee (figure 04). The margins of the split were free of burning or blackening and

there was corresponding damage to the trouser, 1.5cm x 1.5cm split (at lower arrow in figure 01). Trousers were soaked with blood. The deceased also had multiple, parallel and superficial scars on the inner aspect of his left forearm.

DISCUSSION

Gunshot injuries are on the rise in both developed and developing countries, the reason for this may be increased access to firearms. In Sri Lanka, though the access of the guns to public is very limited, some 'gang' groups have access to weapons and possess weapons by illegal means.
The perforated laceration found at the right groin was oval in shape with burnt and blackened margins and was connected to a tract. Therefore, it was identified as a firearm entry wound. The wound found at the distal end of the tract at the right knee was a split, and the margins were free of burning or blackening. Therefore, it was identified as a firearm exit wound. Identification of the entry, tract and exit confirmed that the injury that the deceased sustained was a firearm injury. The small diameter of the entry wound and single narrow trajectory confirmed that the injury was due to a bullet discharged from a rifled firearm. The damage to main femoral arteries is considered as fatal in the ordinary course of nature and the trouser was soaked with blood. The trajectory of the bullet was directed downwards, slightly inwards and backwards, lacerating the right femoral blood vessels of the thigh. Determination of the direction of the bullet's trajectory is important, because it indicates the axis of the weapon barrel in the moment of firing, if there was no external ricochet[3].

The most important aspect of gunshot injury is interpretation of injuries to arrive at conclusions on manner of death. It could be homicidal, accidental, suicidal or unascertainable. Interpretation of gunshot injuries is difficult in the absence of eye witnesses and other circumstantial evidence. In this instance too, eye witnesses were absent possibly due to reluctance to come forward due to subsequent life threats. Therefore, the manner of death had to be ascertained by interpretation of the autopsy findings.

There are elective sites of suicidal firearm injuries such as temple, the neck, the mouth and the chest[4]. Atypical homicidal firearm injuries also can simulate self-inflicted injuries[5]. Though he had self-inflicted scars, the site and the direction of the firearm injuries were not elective of suicide. In homicidal firearm injuries, the preferred sites are the vital parts of the body such as head, neck and chest. Any direction of the tract is possible in homicides. But, killing a person by inserting the barrel of the gun under the waist of the trouser is unlikely. Further, attaining this atypical direction, without inflicting damage to the overlying garments at the entry wound is highly unlikely in a murder.

Though the absence of the gun at the scene is a common feature in homicidal firearm deaths, in this instance, absence of the weapon could have been due to taking it away by another person in the 'gang'.

Carrying the gun under the waist of the trouser is not uncommon and in this case, gun would have fired accidentally possibly while pulling it out. This conclusion was further confirmed by the absence of damages on the overlying trouser at the entry wound and the unusual longitudinal direction of the tract in the thigh.

According to the available evidence and interpretation of injury pattern, the most probable manner was accidental. The cause of death was given as haemorrhagic shock following thigh injuries due to bullet discharged from a rifled firearm.

(Figure 01) blood soaked trouser. No damage to trouser at waist level . There was a split at right knee area (at lower arrow).

(Figure 04) Exit wound was a split at the inner side of right knee. There was a corresponding damage to the trouser (figure 01).

(Figure 02) Firearm entry wound in his right groin, with a rim of haemorrhages.

(Figure 03) Tract was directed downwards, slightly inwards and backwards, lacerating the right femoral blood vessels

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A study on detainees: Effects of war on health and rights

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ABSTRACT

The recently concluded 'war' in Sri Lanka has cost thousands of lives and disabled many people. A proportion of the disabled people and some able men and women are still languishing in detention centers awaiting retribution for their suspected crimes. Since most of them are "hardcore LTTE cadres", 'human rights' activists keep continuous vigil on them to see whether they are maltreated. Medico-legal examinations are routinely performed on them in the following occasions, immediately after taking into custody, prior to release into the community and before and after confession.

A retrospective study was carried out on 50 cases by reviewing Medico Legal documents of detainees who have been referred for medico-legal examination.

Out of 50 cases analyzed majority (98%) of the detainees were young males with mean age of 35 ½ years and from the Northern Province. Most of them had participated in war (74%) and having consequences of war related injuries. 94 % of them were detained for more than 3 months in the detention camp and almost all of them didn't declare ill treatment during their detention. There were no convicted individuals in the sample population.

There are severe effects of war injuries on detainees such as amputated extremities (4%), post traumatic epilepsy (10%) and multiple scars following shrapnel or firearm injuries (58%). They do not complain on mal treatment while in detention. However due process of trial is needed as early as possible to safeguard their rights.

INTRODUCTION

The recently concluded war in Sri Lanka had cost thousands of lives and disabled many people[1] A proportion of the disabled people and some able men and women are still languishing in detention centers awaiting retribution for their suspected crimes. Being LTTE cadres they had been arrested under the Prevention of Terrorism Act [2] months or years ago, before they are produced for medico-legal examination. Under this act a person can be kept in custody without producing before a judge for many months.[2] Naturally human rights activists keep constant vigil on them as they are prone to be maltreated by their keepers.

Laws of detention are different from country to country depending on their requirements. The state of Israel use administrative detention of terror suspects to keep in custody for a long period. [3]Indefinite detention of an individual occurs frequently in wartime under the laws of war [4]; this has been applied by the United States after the September 11, 2001 attacks. [4]

According to the Universal declaration of human rights, a person cannot be subjected to an arbitrary arrest, detention, or imprisonment. [5], [6] This may not be a case in countries where acts of terrorism is rampant. Detention is seen as 'arbitrary' when there is no legal basis for detention or there are grave violations of the right to a fair trial. However, there is possibility of having disparity between the country's laws [2] with the international standards. According to the international human rights law, all defendants have the right to a fair trial and treatment. [5,6]

However, in many countries throughout the world, detainees are held without due process and convicted in trials where these safeguards have been ignored.[7] In some instances people are held for long periods without trial, they are subjected to torture to acquire information or confession. Despite prevalent international criticism US naval base in Guantánamo Bay, hundreds of people from 30 nationalities have been detained without charge [6]

Medico-legal examinations are routinely performed on detainees of Liberation Tigers of Tamil Eelam (LTTE) suspects immediately after taking into custody, prior to release into the community or before and after confession. They are evaluated for health condition, scars, injuries and for possible actions of torture while on custody. Therefore this study highlights the need of further evaluation of situation to understand the magnitude and diversity of the problems related to their health and rights to provide better care for them.

OBJECTIVES:

To assess the socio-demographic details, effects of war on health and violation of rights of the detainees of war

STUDY DESIGN

A retrospective study was carried out on detainees who have been referred for medico-legal examination at the Department of Forensic Medicine, Faculty of Medicine, Karapitiya from Boosa camp over 6 months period in 2012. Investigator's Medico Legal documents of 50 detainees were reviewed and the data was extracted into a data sheet including demographic details, health condition, and history of ill treatment mentioned by the detainee. Data was analyzed using the Statistical Package for Social Sciences (SPSS).

RESULTS

CHARACTERISTICS OF DETAINEES

Demographic details of the 50 detainees were evaluated in this study. Among the total there were 49 males and 1 female with the mean age of 35 1/2 years. (range of 18-45 years) Majority of them had their secondary education (96 %), married (62 %) with children (54%), either from north (62 %) or eastern (32 %) provinces and the rest from upcountry estates. (6%)

DURATION AND REASON FOR DETENTION

94 % of them were in detention camp for more than 3 months and 6% for less than 3 months. While 52% of them detained without a trial for more than a year. According to the history given by detainees most of them had actively participated in war (60 %) as LTTE carders. Only 6 % of them claimed this as an arbitrary arrest. (Table 1)

Table: 1

		Number	Percentage
Duration of detention			
	< 1 month	02	04%
	1 month – 3 months	01	02%
	>3 months -1 year	21	42%
	>1 year	26	52%
Reason for arrest	Suspected as LTTE carder	09	18%
	Surrender him/her self	07	14%
	Arbitrary arrest	03	06%
	Involved in war act and arrested	30	60%
	other	01	02%

MEDICO LEGAL EXAMINATION OF DETAINEES

During their period of detention, (92%) of them were examined by Judicial Medical officer (JMO) following arrest. There were other reasons to be produced before JMO such as before release (02%) and before confession (06%).

Table: 2

		Number	percentage
Previous examination by JMO	yes	03	06%
	no	47	94%
Reason for recent medico Legal examination	After arrest	46	92%
	Before release	01	02%
	Before confession	03	06%

HEALTH CONDITION OF DETAINEES

Among natural illnesses, bronchial asthma was the most common disease (20%) and considerable numbers of multiple scars (70%) which were consistent with those caused by either shrapnel or bullet injuries were detected. Post traumatic epilepsy was reported in 10 % of cases based on available medical reports.

Table: 3

		Number	Percentage
Health conditions			
Natural illness	Hypertension/ ischemic heart disease	04	08%
	Bronchial asthma	10	20%
	Other chronic illness	02	04%
War injuries and effects	No evidence of war injuries	15	30%
	Evidence of war injuries	35	70%
	• Amputation of leg	02	04%
	• Post traumatic epilepsy	05	10%
	• Multiple scars of shell injury or fire arm	29	58%

15 detainees were on medical treatment for their illnesses or trauma however 3 mentioned that they were not on treatment even though they had some ailment but not seeking any medication from prison authorities. Two of them are using their own inhalers and one was found to be hypertensive and referred for further medical action. History of any ill treatment during detention was not declared to the JMO by any of the detainees and medical evidence of ill treatment was not detected at the time of examination. In half of the cases relatives are aware on their detention, however only 1/3 of them were visited by a relative.

Table: 4

		Number	percentage
On medical care for illnesses	yes	15	30%
	no	03	06%
History of ill treatment during detention	yes	-	-
	no	47	94%
	Not sure	01	02%
Relatives are aware on detention	yes	25	50%
	no	01	02%
	Details not available	24	48%
Relatives visited	Yes	08	16%
	no	15	30%
	Details not available	17	43%

DISCUSSION

The findings of this study indicate that majority of the detainees were young males and they are from the Northern Province. It is no secret that seeds for terrorism were initially planted in the Northern Province and more youth were attracted following an ideology of living in a separate state. But what is so disturbing is most youth who have received a secondary education and instead of pursuing a job oriented carrier they were attracted towards terrorist activities. Most of them are married and it may be interpreted that marriage had become no barrier in continuing their idealistic beliefs. Therefore the determination to engage in activities which are considered unlawful in a country and would definitely result in jail sentences had not been hampered by other social values such as education, marriage and personal ambitions.

When we analyse the general physical fitness by way of checking for and debilitating medical illnesses we found that considerable number of them are suffering from Bronchial Asthma (10%) and from effects of war injuries (70%) such as post traumatic epilepsy and amputations. In addition to that substantial number of them had multiple deep scars causing

disfiguration and incapacitation. Majority of the detainees were on treatment for their medical illnesses except a few. Severe effects of war injuries make serious health burden to themselves, to family and relatives and to the community as a whole. [8]

The data available from the history and examination show possibility of most of them had a link with the LTTE organization. While in detention, they were subjected to a JMO examination. In Sri Lanka, the JMO's are considered as an independent Forensic examiner to whom the detainees can express their concerns without the presence of the police or prison officers at the time of examination. This is the accepted practice except in situations where the prisoner is considered a threat to the examining doctor. Therefore providing an opportunity to be examined by JMO in fact can be considered as granting or fulfilling a medico legal right. Further keeping the relative informed about their whereabouts is also a legal right that had been taken place in nearly half of the inmates. Though the relatives were informed, the majority of them could not visit them while in detention. This could have happened due to several reasons. The language barrier and the distance they have to travel from the northern and eastern provinces would have hindered the visits. Further the financial constraints also can play a role other than many social reasons.

The majority of scars observed in the detainees were most likely due to involvement of direct combat activities which is to a greater extent compatible with the given history and examination findings. There were no injuries or scars that they attributed to torture. None of them had complained about ill treatment during detention. Eventhough there is no complains on maltreatment by authorities further studies are needed to assess the awareness of their rights by the detainees.

Further we feel the necessity of their cases to be expedited since many of them are being detained without a trial for more than one year.

LIMITATIONS

It is likely that the outlook on violation of rights of the detainees are underestimated in this study because of some of the information such as availability of lawyers, general facilities, recreational facilities, and counseling cannot be gathered in a retrospective study.

CONCLUSIONS

The study revealed a healthy outlook of the detainees, if we consider the statements they gave to the examining doctor are true and the physical examination revealed only injuries sustained during the combat period. There were no reported incidents of torture. However a proper detailed psychological assessment of each individual together with an education about their rights to which they are entitled would further enhance the reliability of this study. Those who are detained without a trial for more than 1 year needs immeadiate consideration by the legal authorities.

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Declaration

We wish to declare that part of this study was presented for poster presentation at the 12th Academic sessions of College of Forensic Pathologists of Sri Lanka 2013.

Salivary biomarkers and their applicability in forensic identification

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ABSTRACT

The constant advancement of forensic analyses has evolved into a snowball with new questions arising and solutions being looked for everyday. Forensic odontology has come a long way in understanding bite marks, its mechanism and other related factors. In general, bitemark analysis is more than often centralized on imprints of teeth on skin or food substances. What we need to understand is not all the time an entire set of dental marks is available for analysis. An adjuvant is essential to heighten the analysis and arrive at a more convincing result with a scientific backing. Saliva is an integral part of any oral cavity and is the principal focus of this paper. We intend to understand salivary manifestations of diseases and advocate the use of human saliva to identify diseases that may lead us to the suspect in cases involving bite mark analysis.

INTRODUCTION

Forensic analysis has extended into several disciplines including, but not limited to, odontology, chemistry, anthropology, microscopy and so forth. Identification of trace body fluids at a crime scene is paramount in forensic investigations. Body fluids like saliva, blood, semen can be important to criminal investigations and the information derived from them may aid in successful resolution of judicial processes. Saliva as an evidence material is not found very often but may be important in various types of abuse cases. It can be found on skin surfaces, food materials [1] and envelopes amongst many others [2]

BACKGROUND

Bitemark evidence plays an important role in criminal cases involving abuse and has been used as evidence in court. Bites could originate from either the victim or the perpetrator as a mode of defense or as intent to cause injury by the perpetrator respectively. Either way they could contain forensic information [3] Bitemarks on skin normally contain several forms of injuries but most of them also have some contact of the soft tissues. [4] During the process of contact between teeth and skin, the contact of soft tissues result in conveyance of traces of saliva which may be collected during post examination of the bite mark by swabbing the area around the bitemark. This sample would then be compared to a sample from the suspect. This is possible when the suspect is known and a sample from him is obtained. The hypothesis behind this manuscript is "what if the suspect is unknown, What if all we have is a saliva sample with no dental markers enough to identify the perpetrator? Would we be able to isolate salivary markers found in diseases and try and match them with people know to have that condition to arrive at a positive identification of the suspect? The aim of this review is to shed some light on various manifestations of diseases on the oral cavity and advocate the use of human saliva to identify diseases that may lead us to the suspect in cases involving bite marks.

SALIVA

Saliva is a product of the pairs of major salivary glands and several minor salivary glands present in the oral cavity and the buccal cheeks. [5] Saliva is primarily composed of water, enzymes, proteins, electrolytes, mucins and nitrogenous products. [6]

Saliva is derived from salivary glands present below the oral mucosa. A normal human secretes about 600mL of saliva everyday. This saliva is rich in minerals, electrolytes, buffers, enzymes and enzyme inhibitors, growth factors and cytokines, immunoglobulin's (e.g., secretory immunoglobulin A), mucins and other glycoproteins. [7] Once saliva enters the oral cavity making its way through the salivary ducts, it coalesces with blood cells, micro-organisms of the oral cavity, food and upper airway secretions. This

mixture may contain vital information about the quality of life, health and general wellbeing of a person.[8]

In general, saliva helps us in eating, swallowing and also everyday activities like speaking. It helps keep the oral cavity hydrated, hence protecting teeth from microorganisms. [8,9] Along with dental caries detection, scientists have been pursuing interest in identifying salivary biomarkers that can be used to identify diseases and therefore monitor general health of people and detect diseases such as AIDS ,diabetes, Sjögren's syndrome, alcoholic cirrhosis, cystic fibrosis, diseases of the adrenal cortex, cardiovascular diseases, and [10] in the early stage of onset. [6]

The advantages of using saliva over blood have been attributed to its ease of access (except in cases of xerostomia), low costs in acquiring samples and ease of handling (in people with homophobia) and its non invasive collection techniques. The presence of protein and its components and its comparisons in healthy population have been advocated as a possible method of bio-marking as saliva of individuals with diseases may carry certain proteins specific to certain diseases. [6]

SALIVARY FLORA AND FAUNA:

The oral cavity is made up of a large quantity and wide variety of bacteria. Some micro-organisms commonly found in the oral cavity are *streptococcus salivarius* that belong to the *Viridans* group of streptococci and can supposedly be identified by colony morphology on *Mitis Salivarius* on agar plates. [11] More than often saliva is contaminated by the bacteria present in the oral cavity. If this saliva is transferred on to the skin, and it has salivary markers along with the normal constituents of saliva, then it is possible to identify a suspect based on that information.[4] These salivary contents could also transfer on to the micro openings formed on the skin during biting and hence could result in an infection. Brown et al (1983) tried to understand the possibility of fingerprinting bacteria present in saliva to be used as an assistance in bite mark cases when saliva has been left on the skin for prolonged periods and still could be recovered and information collected from it .[4]

OTHER PHYSICAL CONDITIONS CONTRIBUTING TO ORAL CHANGES:

Vitamin K deficiency: Vitamin K is an important factor that aids in the production of procoagulant factors II,VII,IX and X along with anticoagulant factors like Protein C and Protein S. Oral manifestations of vitamin K deficiency leads to submucosal haemorrhage along with gingival bleeding. [12]

Langerhans cell Histiocytosis: Langerhans Cell Histiocytosis is primarily manifested orally with irregular ulcerations of the hard palate along with ulcerated nodules and inflamed gingival leading to halitosis and discomfort on chewing. Larger lesions may result in exposure of underlying bone with ecchymosis and periodontitis sometimes leading to more severe necrotising gingivitis. Radiographically the teeth may have a hallmark "floating in the air" appearance. [12,13]

Hypoparathyroidism: Decreased secretion of the parathyroid hormone normally occurs as a result of surgical remotion of the parathyroid glands. This is because of autoimmune destruction of the parathyroid glands pointing fingers towards rare syndromes like DiGeorge syndrome. Oral manifestations of this condition are presence of pitting enamel hypoplasia and sometimes failure of eruption of teeth. [12]

Mucopolysaccharidosis: Mucopolysaccharidoss is a metabolic disorder caused due to absence or malfunctioning of lysosomal enzymes. Oral manifestations of this disease are macroglossia, gingival hyperplasia of the anterior region of the oral cavity along with several supernumerary teeth and thinning of enamel with pointed cusp tips can be noted. [14]

Kawasaki disease: Kawasaki disease is an autoimmune disease with classic features of edema or erythema of the extremeties, polymorphous exathem, bilateral conjunctival injection, redness of tongue with associated strawberry shaped formations on tongue and acute lymphadenopathy. [12]

Wegener granulomatosis: Wegeners granulomatosis is a vascular disorder and most often indicates an oncoming renal condition.[15] Oral features seen in this disease are the characteristic "strawberry gingivitis" along with

mobile teeth associated with the destruction of the underlying bone. Less commonly, features like the presence of an oro-antral fistula may be seen. [16]

Scleroderma: Scleroderma is a chronic autoimmune disorder having variable oral manifestations. They may be microstomia, xerostomia, loss of mobility of the tongue, widened periodontal ligament spaces and resorption of ramus, coronoid process, chin and condyles can be seen on radiographs.[12] Saliva has been extensively used in detection and diagnosis of oral diseases, but its use as a marker for systemic diseases has been advocated for sometime now. [17] Tables 1 and 2 show probable factors influencing salivary flow/composition and probable salivary predictors for systemic diseases respectively.

DISCUSSION

Saliva constitutes DNA, RNA, proteins and bacteria that may be of interest to the forensic community because of its capacity to carry vital information. [18, 19] Research has demonstrated that there is evident variability in salivary transcriptase profiles between patients suffering from pancreatic cancer and normal healthy controls and may be used in the detection of pancreatic cancer.[20]

Currently, researchers have developed salivary markers to detect and diagnose oral cancer employing proteomic, genomic, miRNA and other metabolic techniques. The proteomic and genomic salivary markers have been validated by a group of investigators from the National Cancer Institutes Early Detection Research Network in the Indian and the Serbian populations and the markers are ready for academic validation in the near future. [17]

Salivary markers have also been tested for their ability to detect breast cancer in concurrence with mammography. c-erbB-2 is a prognostic proteome proposed for use in detection and identification of malignant tumours in women. [6]

CONCLUSION

Systemic diseases are known to manifest irregularities in the head and neck region and the oral cavity in particular. Advanced clinical research in identifying saliva markers that may be used in the identification of diseases is strongly recommended. This would enable wider use of saliva and at some stage may even replace invasive methods of collection of specimen used in detecting and diagnosing diseases. Apart from acting as a diagnostic tool, saliva biomarkers may also be used in forensics, not only in cases involving bitemarks but also in general identification of people and in situations of mass disasters. By matching salivary biomarkers for any particular disease and tracking that disease to hospital visits and hence arriving at a positive identification, these biomarkers may be used to identify people who's DNA are not on any database.

Identifying salivary biomarkers that may be used in detecting and diagnosing systemic diseases based on the relativity between a specific disease and salivary protein changes seen shall surely provide a head start in fighting the disease, but may also provide vital information in identifying a person involved in crime.

It is not always necessary that a person had his/her disease tested and is a known patient, but this method would surely act as a positive reinforcement in the identification process where every bit of information is important and time saving.

Table 1: Probable factors influencing salivary flow/composition

Salivary flow index:	The primary agent controlling composition of saliva is the salivary flow index. This mainly depends on the type, intensity and the duration of the stimulus. This increased salivary flow index results in increased levels of sodium, proteins, calcium, chloride and bicarbonates and decreased levels of phosphates and magnesium. This knowledge may be used as a marker in saliva and therefore be used in forensic situations. [22]
Medications	Anticholinergic drugs like antidepressants, anxiolytics, antihypertensives or antihistamines may reduce the salivary flow therefore changing the salivary composition. Presence or absence of normal salivary constituents can be looked up in cases involving bitemarks where a saliva sample can be obtained. [22]
Alcohol	Extensive consumption of alcohol leads to ethanol overdose directly affecting the salivary flow due to the modified release of proteins and amylase and a decreased output of electrolytes.[22]

Table 2: Probable salivary predictors for systemic diseases.

Condition	Geographic Preponderance	Oral manifestations	Salivary changes (Present or Possible)
Pernicious Anaemia	African American and Hispanic populations in America	Burning of tongue, lips and other mucosal sites of the oral cavity associated with atrophy of tongue clinically presented as magenta tongue.	Possible traces of Vitamin B12 or Cobalamin in saliva?[12]
Leukaemia	None	Diffuse oral candidiasis, associated with spontaneous gingival bleeding.	Traces of oral candida?[12]
Multiple Myeloma	None	Well defined punched out radiographic lesions in the jaw. Enlarged tongue with amyloid deposits on tongue.	Presence of amyloid material in saliva? [12]
Sjogrens Syndrome	None	Thick ropy mucinous saliva, oral candidal infections and presence of inflammation of parotid gland leading to purulent discharge.	Evidence of thickened saliva and traces of candida along with purulent discharge? [12]
Amyloidosis	None	Macroglossia and deposition of amyloid protein on tongue	Presence of amyloid material in saliva? [12]
Diabetes Mellitus	None	Presence of periodontal abscesses, oral candidiasis, marked increase in salivary glucose levels and crevicular fluid. Fungal infections like zygomycosis can be seen too.	Presence of candida, high glucose and crevicular fluid levels in saliva? [12]
Systemic Masto Cystosis	None	Mast cell infiltration into the salivary glands	Evidence of presence of mast cells in saliva? [12]
Iron deficiency anaemia	None	Angular chelitis, atrophic glossitis, glossdynia and is normally a predisposing factor for candidiasis.	Presence of traces of candida in saliva? [21]

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ACHIEVING BETTER PATIENT CARE THROUGH CLINICO-PATHOLOGIC RELATIONSHIP BETWEEN FORENSIC MEDICINE AND OTHER CLINICAL DISCIPLINES

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ABSTRACT

No branch or sub-specialty of medicine could be practiced individually and independently from others. The ultimate purpose of practice of medicine is towards service to mankind both alive and dead. A healthy relationship between Forensic Medicine and other clinical disciplines leads to a mutually rewarding situation. This paper outlines such clinic-pathologic relationships between forensic medicine and other clinical disciplines for better patient care in Sri Lanka.

INTRODUCTION

Sri Lanka is a country where there is a reasonably satisfactory coverage of medico-legal works with bare minimal resources and facilities. When compared with other disciplines of medicine whose primary aim is treating live patients and therapeutic diagnosis of illnesses, one can observe an immense difference in the context of resources and facilities available for these therapeutic disciplines of medicine and for forensic medicine. Still, the medico-legal services of the country are provided to a reasonable standard (as expressed by local specialists as well as foreign authorities who have been maintaining a close rapport with the medico-legal system of the country) using the knowledge, analytical capacity and anecdotal experiences of the forensic practitioners as well as the basic facilities such as H&E staining of histopathological slides, limited facilities available at the Medical Research Institute, limited toxicology and odontology facilities available at the Institute of Legal Medicine and Toxicology-Colombo and the basic plain radiographic facilities reluctantly and remorsefully provided by the respective hospitals. This situation in forensic medicine in the second decade of the 21st century could well be sighted similar to the situation of clinical medicine in the dawn of the 20th century where physicians utilized the fundamentals of clinical examination such as inspection, palpation, percussion and auscultation with their treasured clinical experiences and basic and limited investigative facilities such as full blood count, urine full report and Rontgenographic studies so as to arrive at an accurate clinical diagnosis. In this context, the authors wish to explain how a bi-directional gain could be achieved ultimately aiming at better patient care, through developing a healthy relationship between Forensic Medicine and other clinical disciplines.

DISCUSSION

Clinical Forensic Medicine deals mainly with assaults, different types of accidents, sexual offenses, child abuse, domestic violence, consumption of alcohol and other drugs, torture and human rights violation, war-crimes, impaired motorists, deliberate self harm and so on whilst the diverse medico-legal issues revolving around a death is the arena of Forensic Pathology. Both in Clinical Forensic Medicine and in Forensic Pathology, the forensic practitioner may seek assistance and advice from the respective clinician to clarify certain issues and to maintain the accuracy and precision of his job. On the other hand, the forensic practitioner too can render a service to the clinician by enlightening him on certain twilight areas so as to rectify his clinical practice in future.

It is the duty of the first contact medical officer at the Out Patient Department or the Emergency Treatment Unit to objectively mention about the alcohol status of the patients admitted following assaults or traffic accidents. If he has failed to do so, then it becomes the duty of the houseman to assess and mention the same on the Bed Head Ticket (BHT). In practical context, this

is the exception rather than the rule. Most of the times, nothing is mentioned about the alcohol status while in rare situations something like "alcohol++" is mentioned. It is only extremely rarely that one sees an objective assessment of alcohol status mentioned on the BHT by an admitting officer or a houseman. Not mentioning anything about alcohol status does not mean that the patient had been negative for alcohol but it only implies that the doctor has not taken any interest or attempt to inquire about the alcohol status of his patient. If this becomes a materially significant issue in the courts, then the doctor will have to answer for himself. The Judicial Medical Officer (JMO), to whom the patient is referred at a later date-possibly just prior to being discharged, will invariably be dependent on the BHT for filling the alcohol status on the Medico Legal Examination Form (MLEF).

In case of alleged sexual offenses and abortions, the clinician should not rush to interpret genital findings if he is not absolutely certain of the accuracy of his interpretations. There have been many instances where interpretation or the description given by the clinician on the BHT differs from that of the JMO invariably weakening the case before the courts. A common example would be misinterpretation of natural hymenal folds,notches or bumps as evidence of previous penetration. At the same time, everybody agrees that any forensic considerations are secondary to life saving measures. As such, if a clinician makes any therapeutic interventions on such a patient as surgical repairs of 3rd degree perennial tears etc, it is prudent for him to attempt to take forensically important samples from the genital areas (such as vulvae, low-vaginal and high-vaginal swabs) and at least roughly describe the original injuries before such intervention is made. The same applies to preservation of clothing-specially the undergarments and the material recovered from the genital tract during the surgery. Informing the JMO as early as possible will lessen the medico-legal burden of the clinician as well as allow the JMO to carry out a more rewarding task.

In cases of suspected poisoning, it is prudent to inform the hospital police and then the JMO for further medico-legal management, even if the poisoning initially seems to be a self-ingestion. The samples recovered from the patient such as vomitus, gastric-larvage, contaminated clothing, any suspected material handed over by the relatives and by-standers, initial blood and urine samples etc, should be properly stored and handed over to the JMO for further investigation, maintaining the chain of custody. It is also worth mentioning on the BHT about any peculiar clinical finding such as the smell of breath, colour, smell and the nature of gastric larvage, pupilary size, frothing, involuntary passage of stools and so on.

Burns are yet another type of injuries that lead to complicated medico-legal issues both in the survivors as well as in the dead. Delayed presentation to the JMO together with lack of interest by the clinicians to describe the forensically significant features such as the distribution, depth, surface area, drip marks, association with the clothing, any smell of accelerants such as kerosene, features peculiar to different types of acids and alkali, features suggesting the circumstances etc, make it a rather unrewarding exercise for the JMO to examine a burnt patient or to perform an autopsy on a burnt body. Further alteration of burns due to infection and surgical interventions such as escharectomy will further worsen the situation for the JMO.

We are living in an era of blood-borne infections such as HIV and Hepatitis B. It is the international practice that every autopsy be considered as high risk and thus to stick to universal precautions. Yet, it should be honestly accepted that we are performing in a sub-standard way in our busy mortuaries. It is the mortuary attendant/labourer who is at the highest risk. Therefore, it is vital that the clinicians convey the message of the infectious status of the deceased to the JMO, or at least the suspicion of such a situation prior to the autopsy so that additional precautions could be taken by the mortuary staff. In the same way, if the clinician suspects of such a condition, he should promptly investigate for the same after obtaining the written informed consent from the patient rather than expecting an answer from the forensic pathologist after the autopsy, who will have to depend on a less sensitive post mortem blood sample [1].

In some occasions, patients tend to affirm that they do not wish to proceed for further legal actions and as such they are discharged from the wards without being seen by a JMO. There are

hidden pitfalls in this practice. A person who has sustained injuries while committing a crime may "cook-up" a story of an innocent domestic accident and get away without being noticed by the law enforcement authorities. Clinicians, though they are quite capable of therapeutic management of the injuries, will be quite ignorant in recognizing the peculiar pattern of injuries standing itself as a proof of the fowl-play. On the other hand, a person who initially does not wish to go for legal actions, might later change his mind when he needs to obtain his personal insurance or when the other party who has initially promised him of a pecuniary reward following a traffic accident later declines to do so. Therefore it is prudent for the ward staff to hand over the responsibility to the JMO who has a better overall understanding about such circumstances.

Contribution of pre-existing natural illnesses to death in a person who has recently sustained trauma is always a dilemma for the forensic pathologist. Trauma or natural illness can separately and individually cause the death, while trauma can exacerbate the natural pathology and vice versa. A known patient with significant ischaemic heart disease, meeting with a traffic accident warranting a surgery and subsequently developing an acute myocardial infarction leading to his death is one such situation. Pulmonary thrombo-embolism, sub-dural haemorrhages etc are few other examples. In these conditions, a chronologically recorded, detailed and extensive history of the clinical presentations and the investigations done, would greatly help the pathologist to overcome the difficulties at least to a certain extent.

Injuries are surgically altered in numerous ways during clinical intervention. Trimming of the edges of an irregular laceration before suturing, painting with povidone iodine or Jansen violet, removal of foreign matter, shaving of head hair, application of bandages and plaster casts, insertion of intercostals tubes, drains and catheters, making surgical incisions, craniotomy and etc are just some examples. These are only to be expected as saving the life of the patient is supreme. Yet, sketching of the original wound, writing up of accurate surgical "OP" notes, taking foreign material recovered during the surgery in to safe custody etc can greatly help the JMO to "visualize" the original injury even though it might impose certain additional work load upon a busy houseman.

Due to invariable delay in the process of execution of justice, court cases will come up years after the initial management of the patient. Though rarely, sometimes it becomes pertinent to summon the clinician, the houseman or the staff nurse who was on duty in a particular ward on a particular day. Therefore, it is advisable to legibly mention the full name and the designation of the doctor or the subordinate ward staff member when making entries on the BHT. It is equally important to maintain a well-updated registry in each ward in every hospital over the years so that the ward staff who were on duty at a particular time on a particular day could be traced even years later.

An autopsy is the final systematic scientific investigation in to a death. The clinicians should understand the benefit of performing an autopsy, both for them as well as for the health care system in the country, in addition to the benefits to the deceased person and his immediate family members. A clinico-pathologic co-relation developed through a practice of performing high quality autopsies and comparing the findings with clinical data itself provides a clinical audit and an opportunity for self-rectification.

The autopsy rates are declining globally over the past few years, except in very few countires.[2, 3.] It is a well known fact in the forensic literature that even the coroners and medical examiners tend to make mistakes in the cause and manner of death in the absence of an autopsy. A survey done in the Department of Forensic Medicine in Sydney, Australia had retrospectively reviewed investigative information of all cases in a six month period (429 cases) which were initially considered to be natural in circumstances. The authors have compared the presumptive causes of death with the actual post mortem findings. There were striking differences between the presumed cause of death and actual cause of death. The presumed cause of death was completely wrong in 28% of cases. There were several incidences where the manner of death which was originally thought to be natural had turned out to be non-natural at the autopsy. This highlights the importance of a good quality post-mortem examination.[3]

Until around the sixth decade of the 20th century, it was considered that performing an

autopsy was crucial in cross-checking the clinical diagnosis as well as in understanding the diseases[4]. The advent of various imaging techniques and the "faith" the clinicians have vested upon these techniques is one reason for the falling autopsy rate. Several surveys in various countries have shown that the causes of death issued by physicians, even in hospital deaths bear an error rate of around 25-50%. Correct cause of death is essential for policy planning at national level.

Results of a pilot study conducted in England and Wales aimed at improving the scrutiny of doctors revealed that the cause of death records are erroneous in one out of four patients[5] and it highlights the importance of the autopsies in providing with a rather realistic picture of existing conditions.

Sensitivity and specificity of a test is a crucial matter, as certain lesions or conditions may not be accurately illustrated by investigative procedures such as post-mortem Computerized Tomographic (CT) scans and Ultra Sound scans (USS). Such findings could also be easily misinterpreted by a hospital/clinical radiologist who is not used to "reading" post-mortem conditions. Electrocardiography (ECG) does not always show certain disease conditions of heart. Authors have come across contradicting clinical findings with the post mortem findings of USS, CT scans and ECG[6] etc which were mentioned on the BHT. Achieving of good quality reliable result depends on a good quality post mortem. For this purpose assistance of the clinicians, is really essential. It is a right of the next of kin to know the exact cause of death of their loved ones. It is not only a right, but also it helps to avoid wide array of misdiagnoses as well. When the policy makers do not get the accurate picture of why people have died, it invariably affects adversely on the future health policy planning of the country.[8,9]

A seemingly natural death to a clinician could be a homicide or an occupationally related disease to the eye of the forensic pathologist as he always tries to consider the totality of circumstances[7].

Finally, a healthy and mutually respectful relationship between the clinician and the forensic practitioner would invariably be helpful to both parties to improve the quality of their respective practices and above all will be a positive step towards achieving a best possible care for the patient and providing the justice for the deceased, while helping the accurate policy decisions of the country in the broadest context.

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