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## Editor

Dr. Induwara Gooneratne
Dept. of Forensic Medicine
Faculty of Medicine
University of Peradeniya Tel. 094-81-2388083 / 2396400
Sri Lanka E-mail : induwarag@yahoo.com

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# EDITORIAL

## Forensic Dentistry for Sri Lanka : Assisting its birth and life supporting its future trajectories

Forensic dentistry or forensic odontology is a highly specialized branch in dentistry which deals with proper handling, investigating and examining oro facial evidence for medico legal purposes. Further, it involves evaluation and interpreting oro facial evidence and provision of expert opinions in the interest of justice.

Historically, and at present, forensic dentistry has played a major role in crime investigations and human identification. There are evidence in the history that goes as far back as AD 49, where dental evidence have been used to identify victims (Lollia and Agrapinna incident). Further, Paris bazaar fire (1897) Pijama Girl Case 1934, Ruxton murder case 1935, Haigh acid bath murder and Ted Bundy cases are remarkable historical criminal cases where forensic dentistry was significantly used in the administration of justice. As per recent examples Lokerbie Air disaster, Katrina, 9/11 blast, London Bombing and Tsunami are significant.

The role of a forensic odontologist (a practitioner of forensic dentistry) includes the identification of the unknown, provision of expertise at a scene of crime or mass disaster, age estimations of both living and deceased persons including neo-natal remains, the analysis of bite marks found on victims of attack or on other substances, medico legal examination and interpreting dental and oro-facial injuries, expert testimony, lip print analysis, expert opinions on dental fraud, dental negligence, ethics and malpractice, to name a few.

Currently, forensic dentistry is a well established clinical/ academic specialty worldwide. However, in Sri Lanka, this important discipline is in its infancy or rather in its fetal stages. Only a very basic aspect of forensic dentistry is taught in the undergraduate dental curriculum in Sri Lanka at the one and only dental school in the country and this exposure is not at all sufficient to practice forensic dentistry effectively.

Unfortunately, so far, there is no post graduate training in forensic dentistry in Sri Lanka.

At present there are only a very few dental officers (including myself) who practice forensic dentistry in the entire country. Therefore for those of us who practice forensic dentistry in Sri Lanka had to invariably expose ourselves to foreign training to update/upgrade our knowledge and skills in modern forensic dentistry.

There is a growing demand and an interest in this discipline (forensic dentistry) among dental students, dental practitioners and other stake holders including police courts and criminal justice system which warrant a structured quality post graduate training program in forensic dentistry.

The importance of forensic dentistry has been discussed at many forums in Sri Lanka but unfortunately until recently not much has been done for this important discipline for numerous reasons.

I have been involved in teaching and examining forensic dentistry in Sri Lanka at national level (in addition to providing forensic service function) at the faculty of Dental Sciences (the one and only dental school in Sri Lanka) since 1998 - over 13 years continuously and consecutively. I was able to introduce and revise the curriculum in forensic odontology in the dental curriculum, to suit the current needs and secure a separate forensic odontology module/ unit under oral pathology in the

final year in the new dental curriculum. However this limited hours of learning with no practical exposure is not at all sufficient for effective and quality forensic practice. I was able to propose a further developed forensic odontology curriculum with some basic practical training for the proposed five year undergraduate dental curriculum revision in Sri Lanka. But this nation requires a quality post graduate training in forensic dentistry in the name of professional development, research, team work, service function and justice.

On an invitation by the Faculty of Dental Sciences at University of Peradeniya, I designed and prepared a masters degree level taught course in forensic dentistry to be offered via the faculty of Dental Sciences which was unanimously approved by the faculty board of dental sciences and university. Although this degree is a masters degree, the graduates of this proposed masters degree will not be considered specialists in the health ministry set up (or in military service) as the only qualification recognized by the ministry of heath as a specialist qualification are those qualifications earned through the PGIM (Post Graduate Institute of Medicine). The faculty of dental sciences will have to negotiate with the ministry of health for graduates of this proposed masters degree scheduled to be offered via the dental faculty (if this degree is offered – it is not offered yet) to be promoted to their grade 1 position in the ministry of health or similar positions in the armed forces and police dental core.

Within the administrative framework and professional culture in Sri Lanka, the best way to introduce a post graduate program in forensic dentistry is through the PGIM. After having realized the context and the current need for a post graduate training program in forensic dentistry in Sri Lanka through the PGIM, a special subcommittee was appointed by the Director/ PGIM with the initiation and recommendations by both board of study (B/S) dental surgery and B/S forensic medicine at PGIM to develop a suitable post graduate program in forensic dentistry towards board certification as specialists. I was appointed as the convener of this special committee formulated by the PGIM in which there were three other members nominated by the Board of Study, Dental Surgery and Board of Study in Forensic Medicine at PGIM. A post graduate diploma program and a doctoral level (MD) program in forensic dentistry which was developed by me after having perused almost all international curricula was proposed to this special subcommittee and it was approved by this special committee with some constructive suggestions. Subsequently this curriculum was approved by both boards of study in Dental Surgery and Forensic Medicine at the PGIM. It is my hope that this program will come out as a successful program in the year 2013.

My personal estimate is that in 15 years time since inception of this PGIM program, at least 10 specialists (who obtain MD and board certification) need to be trained for the nine provinces (one for each province) with two based in Colombo. Those who obtain the post graduate diploma may work at senior house officer level (in grade 1 position) in the ministry of health or in parallel positions in military departments and contribute their services . The faculty of dental sciences may continue with their master degree program in parallel for those who are interested especially for foreign candidates.

The PGIM may have to revise the curriculum in time to time and decide as to how many trainees required to be recruited given the true need, workload and the demand.

With the proposed post graduate training program, not only the forensic dental service function will be effectively established but also the research outcomes, policy and practice changes, necessary for forensic dental practice will be created in addition to Sri Lanka being an international centre for forensic odontology training for the region.

As forensic medicine and other dental specialties such as maxillo - facial surgery,

restorative dentistry orthodontics, oral pathology, community dentistry are well developed and highly established disciplines, specialists of those disciplines have to actively help and promote to develop this neglected subspecialty. Fortunately, both the forensic medical profession, PGIM and the dental profession have supported the proposed forensic dentistry post graduate training program though out, which is commendable.

I am sure and optimistic that forensic dentistry will have a prosperous future in Sri Lanka with the blessings of the forensic medical profession, dental profession, legal profession, criminal justice system and the public.

**Dr. Induwara Goonerathne**

*Editor / Sri Lanka Journal of Forensic Medicine Science and Law*
*Senior Lecturer, Department of Forensic Medicine &*
*Visiting Senior Lecturer and Examiner in Forensic Dentistry and Ethics*
*Faculty of Dental Sciences*
*University of Peradeniya.*

# A MATERNAL DEATH DUE TO AN ILLEGAL ABORTION

## - A Case Report -

**W.N.S. Perera & P. Paranitharan**
*Department of Forensic Medicine, Faculty of Medicine, Ragama.*

## Introduction

Pregnancy places a woman at some risk for illness and death. This risk may be gladly assumed with a desired pregnancy. Unwanted pregnancy places a woman at additional risk if she seeks abortion as safe services are not often available.[1,2] This risk may be varying from morbidity such as infertility to mortality.

The World Health Organization estimates that 25 to 50 percent of the 500,000 maternal deaths that occur every year result from illegal abortion.[3] Most of these deaths occur in underdeveloped countries. The data on preventable morbidity and mortality from septic abortion are staggering and well documented.[4, 11]

## Case history

A 39 year old lady living together with her male partner had missed periods and pregnancy was confirmed. She went to a "place for abortion". At that place a tube was inserted into her vagina and suction was done by the "abortionist". After coming home she had severe vaginal bleeding and chills. Second day she was admitted to the hospital with fever, abdominal pain, heavy vaginal bleeding and low blood pressure. Third day evacuation of retain products of conception and laparotomy was performed suspecting bowel perforation. Subsequent to the surgery she had cardiac arrest and was ventilated. Further she had persistent hypotension elevated liver enzymes, detoriating renal functions, coagulation defects and bleeding tendency. On fourth day she died in the Intensive Care Unit in spite of vigorous resuscitation.

## Post mortem examination

At autopsy she was pale; there was haemorrhage into the venepuncture sites, confluent petechial haemorrhages on the body and no injuries to the genitalia. Surgical incision on the abdomen was intact and not infected. There was subarachnoid haemorrhage, lunges were heavily congested. Bowels were dusky, omentum was soft. Liver had nutmeg appearance, kidneys were reddish and swollen, spleen was soft. Uterus was enlarged, uterine tubes and ovaries showed haemorrhagic patches with bluish discolouration. There were foul smelling blood clots in the irregular uterine cavity. (*Figure:1*) Uterine wall was devoid of perforations.

Pseudomonas infection was positive from the retained products of conception. Histology revealed features of organ failure, necrotic material with remaining fetal tissue in the uterus (*Figure:2*) and neutrophil infiltration into the myometrium. (*Figure:3*) Cause of death was ascertained as complications of septic abortion.

## Discussion

Mortality and morbidity from septic abortions are frequent in countries where the induced abortions are illegal or inaccessible. In Sri-Lanka induced abortion can be done legally only to save the life of the mother.

To cause the death of this lady, two major factors were contributed to the development of complications of septic abortion. Those are presence of retained products of conception following illegal abortion and infection introduced into the uterus at the time of abortion. Abortion-related deaths result primarily from sepsis. [8,9] Infection

usually begins as endometritis and involves the endometrium and any retained products of conception. If not treated, the infection may spread further into the myometrium and parametrium. The patient may develop bacteremia and sepsis at any stage of septic abortion. In this case, presence of highly virulent pseudomonas infection in the uterus can act as a focus of infection releasing endotoxins and exotoxins. This will cause systemic inflammatory response as a reaction to bacterial infection. Further release of vasoactive substances is associated with organ dysfunction, hypo perfusion or hypotension, metabolic abnormalities, and microcirculatory failure leading to septic shock. In this case there were evidence of bleeding into tissues, subarachnoid haemorrhage due to coagulation and bleeding defects. Macroscopic and microscopic appearances of the organs as well as clinical investigations suggested organ dysfunctions and metabolic defects. Combined complications of sepsis had caused the death of this person.

Primary prevention of septic abortion includes provision of effective and acceptable contraception; provision of safe, legal abortion services in the case of contraceptive failure; and appropriate medical management of abortion. [11]

## Conclusion

Serious complications are resulted from illegal abortion causing morbidity and mortality. Reducing maternal mortality by preventing illegal abortion is a challenge. Mostly ethical, religious and political obligations prevent discussion on health values to prevent maternal deaths from illegal abortions. Therefore we need to initiate a discussion among medical and legal community to reduce the number of maternal deaths from illegal abortions.

***Figure 1: Blood clots in the uterus***

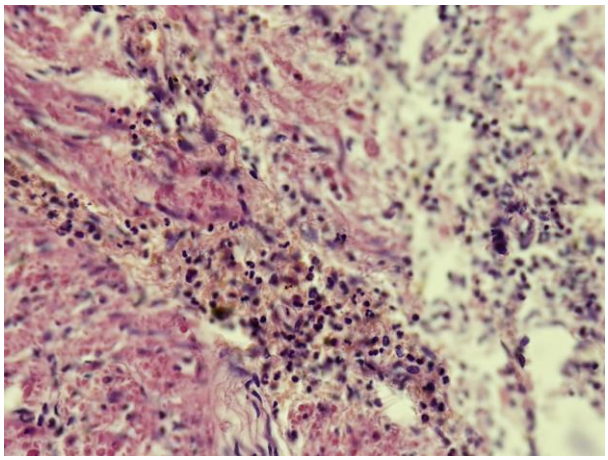

***Figure 2: Neutrophils in the Myometrium***

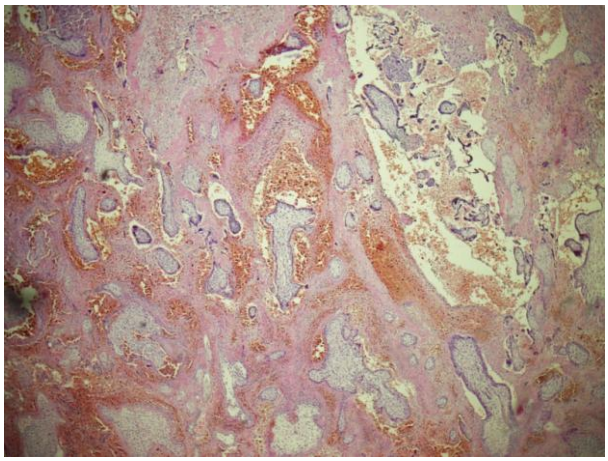

***Figure 3: Chorionic villi in the uterus (Slide from ERPC)***

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# DO RITUALS VIOLATE THE RIGHTS OF THE MENTALLY ILL PATIENT?

**[1]G.S.S.R. Dias & [2]Induwara Gooneratne**
*[1]Department of Psychiatry, [2]Department of Forensic Medicine,*
*Faculty of Medicine, University of Peradeniya*

## Introduction

Health seeking behaviour of Sri Lankan psychiatric patients is influenced by traditional practices and cultural beliefs. Though the bio-psycho-social model accommodates the cultural aspects to some extent, in many cases, family members subject their sick for ritualistic management in out of proportion as ascribed by the model. However, these rituals involve rigorous physical procedures which could be abusive, thus, leading to violation of rights of the individual.[1]

A study carried out on the pathways to care for mentally ill patients has revealed that up to 45-55% of patients seek ritualistic managements before embarking on allopathic treatment.[2] There are instances where the ritualistic healers have referred the patient to the clinics for allopathic medication[2]. The type of ritualistic treatments ranges from tying of a cord around the wrist or neck, a ceremony of "*dehi kapeema*" to charms and ceremonies carried out at temples, kovils, mosques or churches to Thovil ceremonies. Many care givers in the context of ritualistic treatment do read charts of their patients as a guide towards the management, of the mental illness.

Medical negligence is an active process where the treating medical team, omit or commit an act with the intensions, otherwise to the recovery of the illness, which cause complications or detrimental effects to the patient. There are legal processes directly concerned on these issues where an allopathic doctor may need to stand trial. This process safeguards the patients' rights due to which the patient is indeed explicitly or implicitly benefits from the treatment process.[3]

There are many issues of negligence in terms of ritualistic practices. For example the question regarding the consent of the patient to be subjected to the ritual is a very basic issue. There are rituals which are physically demanding such as walking on live charcoal, hitting the body by objects, introducing foreign bodies and physical exhaustion. There are no regulatory bodies to control these activities as these are performed on good faith. The only scaffolding the legal system of the country offers in this context is the criminal justice system.

This study therefore, aims to identify violations of rights, ethical issues and medico legal implications of ritualistic management of the psychiatric patient.

## Materials and Methods

Findings from the assessment of four cases referred to the Psychiatric Unit of the Teaching Hospital, Peradeniya and a case published in local news papers are included in the study. In order to illustrate the gravity of the problem, each case is analyzed for issues of violations of rights, ethical issues and medico legal implications of ritualistic management.

### Case One

The first case is that of a 35 year old female who presented with a history suggestive of depression, hospitalized subsequently and was treated accordingly. Physical examination of the patient showed several 5-6 cm long, linear abrasions over the scapulae on both sides. On questioning it was revealed that she was forced to undergo a ritual against her will. In this process she was physically assaulted by the ritualistic healer with the inflorescence of the areca nut tree.

**Case Two**

The second case is a 35 year old widow, presented with severe depression, after being subjected to a severe abusive ritual. She was physically restrained by six men, neglecting her cry for help, was forced to hold burning camphor until it was completely burnt off. This treatment was performed with the proxy consent of her family, against her will.

**Case Three**

This is a diagnosed schizophrenic patient who was stable on medication. A healer has stopped all the medications and requested to only consume a vegetarian diet and mainly to eat fruits. Due to the lack of continuity of the medication the patient relapsed and attempted deliberate self harm.

**Case Four**

A 24 years old female who presented with acute symptoms of mania had burn marks impregnated on her soles and in between her toes, due to burning of camphor tablets by the ritualistic healer.

**Case Five**

A middle aged woman was reported dead due to an assault by a ritualistic healer while performing a "charm" during a trance state. The post mortem confirmed that there had been intracranial hemorrhages' due to blunt trauma.

## Discussion

Healing is a process for which there are many stake holders. [4, 5, 8] Allopathic medication is only one of them. It is a common practice in Sri Lanka, when a loved one is ill, to sought alternative treatment options, such as Aurvedic medication and even to consult astrological charts of the patient. These diverse health seeking behavior is conceptualized in the Bio-Psych-Social model of illness, is common for any illness. Therefore, there is no disagreement regarding the different modes of remedial approaches such as ritualistic healing, alternative methods and allopathic practices of treatment for a person's diagnosed as ill, even mentally ill. The discussion focuses on the issues pertaining to consent for the procedures and the physical abuse carried out in some systems of treatment and their medico-legal implications.

Informed consent is defined as having a clear and a full understanding of the nature of the condition to be treated: the procedures available and their probable side effects. The agreement for a procedure should be free to receive the treatment. Also should be competent to take decisions having legal capacity. The consent is a process that should cover the whole procedure and at any stage of the remedial procedure the patient should be able to withdraw.[8]

In the light of the above definition ritualistic mode of treatment has a very blurred view of consent. Due to the extreme faith placed in part of the family on the ritualistic healer especially in a very desperate state, for a cure of the mental illness family often disregards the consent of the patient. For example the case reports one, two and five all are examples of such practices. The mere fact that the patient had to be held by force indicates that the patient did not give consent or could not reverse the consent perhaps been granted unknowingly of the procedures the ritual involves. It is sad that the patient in case five had to pay the price by her life.

The physical abuse which is traumatic both physically and emotionally has been illustrated in all the above cases. The grievous nature of these rituals is justified by a "promise'' of a miraculous healing. These cases illustrated could be considered as a random sample of what is happening in the population of ritualistic remedial seekers in the community. This could be a group of silent sufferers who have no voice to let the world know that the patients' rights and their human rights are impinged upon in the name of "healing''. [6,7]

In the context of psychiatry, the reason for a person to approaches a ritualistic healer is because that would curtail the issues of stigma associated with attending a psychiatric service. In addition, less awareness of the available services and the relative scarcity of the allopathic service provision compared to the ritualistic healing is another important attribute. Whatever the cause there is a very real problem associated with these ritualistic healing.

The fourth case illustrates the fact that some ritualistic healers give contradictory message which is an omission than a commission of malpractice. If a patient is stable on medication and if one advises contrary, to the factors which maintains remission, should be considered as a very serious issue. The more pragmatic way in this instance should be to mutually respect each system and to function in a complementary manner, rather than to be reprimanding.

Unfortunately, there is no legal safeguard within the Sri Lankan law which addresses these issues. It is the criminal justice system finally deals with the extreme cases which is the tip of the iceberg. The great majority are not recognized nor addressed adequately in terms of judicial system. As the treating psychiatrist is the person responsible for the well being of the patient there may be instances where the court may summon the treating psychiatrist to explain the injuries, for which the psychiatrist may not be aware of nor responsible.[9]

In conclusion there should be an active discussion leading to a policy change paving the way to legislative reforms in terms of the functioning of the ritualistic healing practices in Sri Lanka, to safeguard the patients' rights and their human rights also giving due emphasis to cultural values and relativism. This invariably will provide ample space for multiple systems of healing including ritualistic healing processes to work together in harmony to bring the best for the patients. This is truly be the actualizing of the Bio-Psycho –Social model of ill health in Sri Lanka.

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# THE USE OF PSYCHOLOGY IN THE ADMINISTRATION OF JUSTICE IN SRI LANKA

## - A Point of View -

**Piyanjali de Zoysa**
*Dept. of Psychological Medicine*
*Faculty of Medicine, University of Colombo*

### Psychology and its specialities

Psychology is a science concerned with the study of behavior, both human and animal, and is therefore interrelated with other disciplines including philosophy, biology and sociology (Myers, 1996). In the minds of most though, psychology is connected with mental disorders (clinical psychology) or with assisting the resolution of relationship problems (counselling psychology). Seemingly there is a lack of understanding that psychology – as the study of human and animal interactions – also encompasses how these organisms perceive the world around them and how they react to these perceptions. Interactions of this kind may be observed in all areas of human activity. The areas of investigation for psychologists are therefore vast and varied as illustrated by the many specialized fields of psychology open for study, such as; Organizational Psychology, Environmental Psychology, Educational Psychology, Forensic Psychology and Sports Psychology.

Central to the psychological inquiry are the answers to the question *why*. From this core question stems the development of psychological theories of human functioning, often expounding new approaches to current knowledge. It can thus clearly be seen that both 'normal' and 'abnormal' behavior are within the domain of psychologists (Myers, 1996). Although psychology is a comparatively young science, it is very fluid, and hence may influence other disciplines, particularly those focused on elements of human interactions, such as: Engineering, Management and Law. However, the cornerstone of psychological practice still revolves around the investigation, intervention and treatment of mental, behavioral and emotional problems, whatever its source; be it stress associated with ones' working environment, trauma or shock following a catastrophic life event or the development of a particular mental illness such as social phobia. From here either autonomously or within a multidisciplinary team, psychologists seek to offer up answers and formulate methods for intervention.

A professional may only be deemed a psychologist if she or he has a first degree in psychology and further post graduate training in psychology to masters or doctoral level (Marzillier & Hall, 1999). In Sri Lanka, recognition as a psychologist requires training to masters level, however, in other countries training to doctoral level is the norm (e.g. United Kingdom and The United States of America). As highlighted above, Psychology is a vast discipline with numerous specialties and sub-specialties. For instance, clinical psychologists possess specialized training in working with people with mental illness. They either may work independently or in a team setting (with other mental health professionals such as psychiatrists and social workers) and subsequent to assessing and diagnosing patients, they may provide psychotherapy to their clientele (Marzillier & Hall, 1999). Organizational psychologists on the other hand are those with specialized knowledge on the human facets in an organizational or institutional setting. Typically, their work may involve, among others, trade union negotiations, psychological testing for employee recruitment and, executive

coaching. Educational psychology, another specialty in psychology, links with education and hence these psychologists may be involved in work such as designing curriculum and pedagogy to ensure students are able to learn in the most effective way, including those with learning difficulties. Though these and other specialties of Psychology are distinct, due to the nature of their training in the human mind and behavior, there is considerable overlap between the work undertaken by these different types of psychologists. In Sri Lanka, the number of psychologists is small; figures indicate there are only about 20 psychologists (of varying specialties) working in the entire country (De Zoysa & Ismail, 2001). Hence, in many contexts where the services of a psychologist are required, there may not be a suitably qualified person to fulfill this need.

## The speciality of Forensic Psychology

The specialty of forensic psychology is most closely linked with the administration of the justice system. Forensic psychology (sometimes also referred to as legal psychology or criminal psychology) is concerned with the psychological dimensions of legal processes. Key tasks undertaken by forensic psychologists include crime analysis and criminal profiling; presenting expert evidence in court, particularly in relation to the mental status of an alleged victim or perpetrator; providing research evidence to support the dispensation of criminal and civil justice; undertaking statistical analysis for prisoner profiling; piloting and implementing treatment programs for offenders; modifying offender behavior; advising parole boards and mental health tribunals; and responding to the changing needs of prison staff and prisoners. Forensic psychologists may be employed by the prison service, the police service, in the social service (including young offenders units and the probation service), in the health service (including rehabilitation units and secure hospitals), and in university departments or in private consultancy (British Psychological Society, 2010).

Within the criminal justice system, in addition to psychiatrists, forensic psychologists, may also work with persons of questionable mental status. These two disciplines are closely related, yet each has a distinct focus. Forensic psychology is involved with understanding a suspects', or an accused persons' or a prisoners' mental status. Forensic psychiatrists, on the other hand, are focused on diagnosis and management of a mental illness, identifying, and categorizing the specific symptoms of mental disorders etc. Forensic psychiatry therefore focuses on determining the type of mental disorder the person has and thereby assessing his or her criminal responsibility or liability. Forensic psychologists, due to the nature of their training and experience, approach legal issues differently to forensic psychiatrists. Whilst both forensic psychologists and forensic psychiatrists are called to work on behalf of either the prosecution or the defense, forensic psychologists are responsible for determining the mental capacities of the person concerned. This may, for example, involve measuring the victim's intelligence level (say, in the case of rape and assessing the ability to give consent in sexual activity) or evaluating reading ability. These mental capacities may be assessed by administering psychological tests and/or a through a clinical interview with the person concerned. In terms of the respective training that forensic psychologists and psychiatrists must undertake, there is a difference in focus and emphasis. Forensic psychiatrists start their careers by completing a five-year medical degree. They then complete post graduate training for several years in general psychiatry and further training in the track of forensic psychiatry. Forensic psychologists on the other hand, having obtained a degree in psychology, usually obtain either a masters or a doctorate in psychology, with a specialist track relating specifically to forensic psychology. Since a doctorate demands a greater component of research-based training, forensic psychologists have

the exposure to, and understanding of a broad range of research materials and tools, which they can draw upon and utilize when working in the field.

## Forensic psychology in Sri Lanka

As in other specialties of psychology, forensic psychologists need to have a first degree in psychology and postgraduate training in forensic psychology, at least up to the masters level. Since psychology is a young discipline in Sri Lanka (De Zoysa & Ismail, 2001) there are no known forensic psychologists in the country. However, there are a few other specialists such as clinical psychologists, educational psychologists and developmental psychologists (De Zoysa *et al*, 2010) who are called upon to provide forensic psychology services to the justice system of the country (De Zoysa, 2002). Clearly, these other specialists cannot offer the breadth of specific services that a specialized forensic psychologist could offer the administration of justice. The unique training of a forensic psychologist, in both psychology and the law, equips them to offer a unique suite of skills and knowledge. But, in the absence of these specialists, the justice system can still gain valuable input from already available clinical, educational and developmental psychologists, as well as other psychology specialists where appropriate, in the administration of justice. For example, as discussed above, clinical psychology is a speciality of psychology concerned with the assessment and management of mental illness and abnormal behaviour preferably in a team set up. This field integrates the science of psychology with the management of complex human problems, including mental illnesses. Due to this expertise, a clinical psychologist might be called upon to provide mental health services such as assessment and provide clinical management assistance to individuals who have come into contact with the criminal justice system. They may also be asked to provide expert evidence on a range of conditions such as alleged child abuse (De Zoysa, 2002) and capacity to give consent to sexual activity (say, in the event of suspected rape).

## Providing psychological evidence in court: Possibilities and issues in the Sri Lankan context

Across the globe, it is now over a century since psychologists first furnished courts with psychological expert evidence (Gudjonsson, 2003). However, in Sri Lanka, it is the authors' observation that psychologists (typically clinical psychologists) have been called on to do such work only within the last decade. Be it globally or in Sri Lanka, the scope of forensic psychology has grown and there is an increased demand for psychological reports and other psychological services in the administration of justice. This growth is seen both in criminal (e.g., in the assessment of alleged child abuse) and civil proceedings (e.g., in child custody issues in divorce proceedings). In the absence of forensic psychologists in Sri Lanka and their specialized contribution to court work, other specialties of psychology in the country (such as clinical, educational and developmental psychologists) can be called upon to contribute in the following ways:

1. Expert opinion regarding psychological conditions – because of clinical psychologists' training, they may be called upon to evaluate the existence of a psychological condition in an alleged victim, suspect or even a witness. In the Sri Lankan context, this is particularly so in the case of alleged child abuse where based on the authors' experiences clinical psychologists are increasingly called upon to assess and establish such allegations.

2. Child custody evaluations – given clinical or developmental psychologists' training in mental health, family functioning, and psychological conditions, they could be called upon to offer opinion regarding the most suitable custody arrangements at the time of a parental separation or divorce. Although this role is mainly played by

social workers in a team set up , in the absence of such an entity in Sri Lanka, a psychologist may assist in regard.

3. The revision of laws – recent advances in psychological research has revealed much about human psychological functioning. These advances have been applied practically, including in the revision of the laws of the country. For instance, since the 1970's, homosexuality ceased to be considered a mental illness and is now considered a matter of sexual orientation along with heterosexuality. However, these advances in research into sexuality are not reflected in Sri Lankan laws where homosexuality remains a criminal offence. Psychologists therefore could contribute to the work of committees that are involved in the revision of these out dated views to ensure such changed norms are incorporated into the laws of Sri Lanka.

Despite the potential contribution that psychology could make to the administration of justice in Sri Lanka, the authors believe that most psychologists, and indeed most other health professionals, are reluctant to become involved in court work. Arguably there are various reasons for this, key amongst them is that psychologists in Sri Lanka find it difficult to balance the massive demands made on their time. For instance, there are only a handful of clinical psychologists (and only five are in the government sector) for a population of more than 20 million people in the country (De Zoysa, 2002). As these psychologists are not specialist forensic psychologists, they also have other mandatory duties to attend to, such as attending to those with mental illnesses. It is difficult for this small group of professionals to juggle these other duties with court work, a fact further compounded when travel to other parts of the country is required in order to give expert evidence at the time of a hearing. There are also other reasons for psychologists to feel rather reluctant to become involved in forensic work: first by furnishing a written report to the court the psychologist is often subsequently summoned at trial as well. Secondly, a reluctance to undertake forensic work also stems from the protracted carriage of cases, which are often postponed several times, taking months or even years to reach a final verdict. The reality is that, having to attend court hearings many times over each time a case is postponed or adjourned deprives the psychologist from too much time from what is already a demanding work schedule. The following example from one of the author's clinical work typifies the problems identified above:

*A paediatrician referred two children, aged 3yrs and 5yrs, to the author for a psychological assessment due to an alleged occurrence of sexual abuse by the children's father. The first contact between the author and children was in September 1999. The author was able to assess the children, confirm the alleged sexual abuse and present the assessment report within a few weeks. The author was then summoned to courts seven times. Thus, the author had to present herself at courts in response to these summons, cancelling all her other professional commitments, only to be notified on the designated day that the case was once again postponed. Finally the author had the opportunity of presenting her evidence on August 2001.*

Importantly, this example represents the rule rather than the exception in the Sri Lankan judicial system. In fact, most cases are delayed for more than the two years required for this particular case to be finalised. Needless to say, this situation is far from satisfactory and makes others shy away from appearing in cases of child abuse. One possible solution to this problem, other than speeding up court processes, might be to reduce court summons and rely solely on the psychologists' report. However, relying solely on the report has its own disadvantages too, including that such an approach may be seen to compromise the accused's right to a fair trial in the absence of an opportunity for cross-examination of the reporting psychologist. Appropriate safe-guards would have to be put into place

to ensure the interests of the administration of justice are not traversed.

## Concluding thoughts

It is clear that psychologists play a critical role in the administration of justice in Sri Lanka, however, given the small number of psychologists in the country and the current absence of specialist forensic psychologists, greater attention needs to be directed to how other specialist psychologists can best service the needs of the administration of justice with due regard for the competing and often unreasonable workload demands placed on this small but clearly indispensible group of professional psychologists.


## Acknowledgements

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# A DEATH ON SURGICAL TABLE DUE TO RENAL TUMOR EMBOLISM

## - A Case Report -

**S. R. Hulathduwa**
*Senior Lecturer. Dept. of Forensic Medicine, University of Sri Jayawardanepure. Sri Lanka.*

A 45 year old farmer from a remote area of Sri Lanka was referred from the local hospital to the Surgical Clinic at the CSTH. He complained of fullness of the left side of the abdomen, left loin and lower back pain and painless haematuria for the past three years.

On physical examination, a non-tender ballotable mass was detected in the left lumbar region. Ultra sound scan revealed a diffuse ill-defined mass involving the hilum and the upper pole of the left kidney. CT revealed a tumor originating from the left kidney involving the upper pole, hilum, perenephric fat and extending through the right renal vein in to the inferior vena cava up to 4cm above the junction of the left renal vein. Provisional diagnosis of renal cell carcinoma was made and surgery for removal of the left kidney through abdominal approach was planned. Written informed consent was obtained after explaining to the patient of the possible complications. Pre-surgical assessment by the consultant anaesthetist revealed no contraindications for a major surgery, though he was found to be hypertensive throughout hospital stay.

Surgery was carried out by the consultant surgeon and his senior registrar. The consultant anaesthetist was incharge of the patient.

A highly vascular and irregular mass involving the upper part of the left kidney and perenephric fat was detected. After successful nephrectomy had been carried out, the patient suddenly became haemodynamically unstable and went in to cardiac arrest. The surgical team clinically suspected pulmonary embolism.

While cardio-pulmonary resuscitation had been continued by the consultant anesthetist, the surgeon started a midline thoracotomy to approach the right side of the heart. Another consultant surgeon was called for assistance. Upon opening in to the right ventricle and the pulmonary trunk, an irregular embolus obstructing the main pulmonary trunk was detected. The proximal portion of the embolus had been removed. The surgery lasted for nearly four hours. Despite resuscitation the patient died on the table. An inquest had been requested. The medico-legal autopsy had been performed by a consultant forensic pathologist.

### Autopsy findings

The body was that of an averagely built, middle aged male with a surgical incision extending from the suprasternal notch to pubis. The body as well as the surgical specimen of the excised kidney had been examined during the autopsy.

The excised kidney was irregular and enlarged measuring 18x09 cm. The bisected specimen showed the hilum and the upper pole as well as several other areas extensively infiltrated by a soft, friable, purplish, vascular tumor which also has spreaded in to the renal vein. The careful dissection of the body revealed remnants of the tumor in the left renal vein and the lower part of the inferior vena cava above the renal veins.

Cardiac dissection revealed a saddle thrombus obstructing the distal pulmonary trunk and its bifurcation. Meticulous dissection of the broncho pulmonary tree of both lungs did not show any macroscopic abnormality. Histology of the left kidney revealed a clear cell carcinoma. Histology

of the impacted material in the pulmonary trunk revealed a tumor embolus of renal cell carcinoma with same cytological feature of the tumor found in the left kidney. Other organs of the body were macroscopically unremarkable and histologically the other kidney showed early evidence of systaemic hypertension. Deep veins of the lower limbs and the pelvis were devoid of thrombi.

## Discussion

Benign tumors of the kidney are rare. Renal Cell Carcinoma (RCC) is the commonest of the tumors of the kidney in adults. It accounts for 70% of the renal tumors and nearly 85% of renal malignancy in adults. It arises from proximal tubular cells. Out of the many types, Clear Cell Carcinoma (CCC) is the commonest which accounts for 70% of RCC. Hereditary RCC tend to be bi-lateral whilst less than 2% of sporadic cases are bilateral.

RCC shows a male preponderance. Peak incidence is between 60-80 years. Advancing age, male sex, smoking, obesity, hypertension, long term dialysis, certain genetic factors, Von Hippel Lindau Syndrome, tuberous sclerosis, exposure to asbestos, petroleum products and heavy metals like Cadmium and working with coke ovens are some recognized risk factors. **(1)**

Only 10% of the patients present with the classical triad of haematuria, loin pain and abdominal mass. The more common presentations are hypertension, cachexia, weight loss, pyrexia of unknown origin, fatigue, peripheral oedema and features of paraneoplastic syndrome. Around 25-30% of patients present with symptoms of metastatic disease.

RCC spreads to adjacent structures including adrenal gland, liver, spleen, colon, pancreas and local lymph nodes. It may also extend to the renal vein and inferior vena cava. Cannon ball secondaries in the lungs are the commonest metastatic presentation. Secondaries of RCC produce osteolytic lesions.

Surgery is the gold stand of treatment with or without radiotherapy and chemotherapy. This depends on the staging of the tumor based on TNM 2002 system recommended by the European Guidelines. **(2)** Radical nephrectomy of the tumor-bearing kidney is the surgery of choice for unilateral localized RCC while extended lymphadenectomy in selected cases might improve the prognosis. Nephron sparing surgery, laparoscopic surgery, image guided percutaneous radio frequency ablation, cryoablation, microwave ablation, lacer ablation, high intensity focal ultrasound ablation etc. are other approaches with specific clinical indications. Tumor embolisation has limited indications. It has been recognized that there is no benefit in performing tumor embolisation before radical nephrectomy.

Prognosis depends on anatomical, histological and molecular factors. Overall 5 year survival is approximately 60%. Yet the actual prognosis in a given case depends greatly on the staging and the grading of the tumor at the time of diagnosis.

With reference to this particular patient, his age of presentation was fairly early than the majority of the cases. Probing in to his past medical, social, family and occupational history could not delineate any recognized risk factors other than the male sex. His mode of presentation with abdominal mass, loin pain and haematuria fell in to the 10% minority of so called "classical presentation". As there was no recorded history of hypertension before being referred to CSTH, it is difficult to conclude whether systaemic hypertension is an effect of the renal tumor.

Full range of imaging and other investigations successfully excluded metastatic disease or pre surgical pulmonary embolism. Renal vein involvement and extension in to infra diaphragmatic inferior vena cava was evident in this patient which is said to occur approximately in 33% and 6% of patients respectively. **(3)** Massive pulmonary embolism though it occurs relatively rarely, is a major hazard which has resulted in numerous deaths, especially during

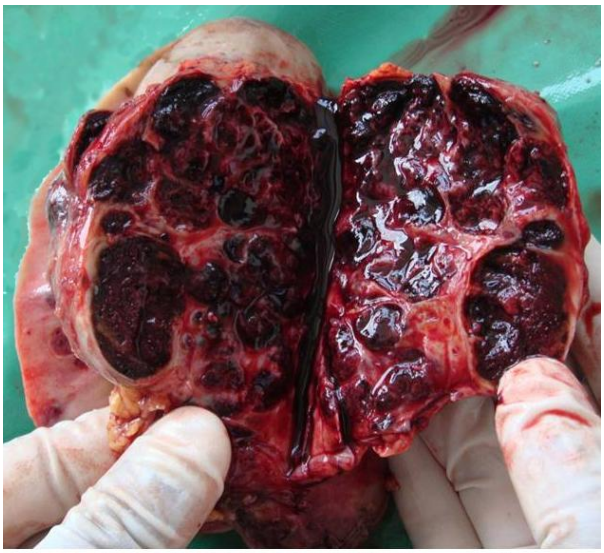
induction of anaesthesia and resection. **(4)(9)** The mortality of massive pulmonary tumor embolism is high and reported cases of successful management are few. Daughtry and associates report the first successful removal of such embolus in 1977. **(5)** Few successful cases of emergency pulmonary embolectomy during radical nephrectomy have been reported in the literature. **(6)(7)** Application of temporary venacaval filters to prevent fatal pulmonary embolism during nephrectomy had been tried by several authorities with promising results. Our patient did not have detectable tumor emboli prior to surgery and the embolisation occurred during the surgery which proved to be fatal.

MRI had been used for preoperative staging of RCC and according to one such classification this patient conforms with the Level ii,(also called Level B) where there is caval extension of the tumor more than 2cm above the renal vein but not within the intrahepatic vena cava. **(8)** Sudden haemodynamic instability and cardiac arrest of the patient could well be attributed to the extensive size of the saddle thrombus and the suddenness of its occurrence. The same explains the near normal macroscopic appearance of the lungs at the autopsy and the absence of histological evidence of emboli in lung samples. It also to a reasonable degree, excludes previous tumor embolism during life. Dissection of the deep veins of lower limbs and pelvis was helpful to exclude concomitant deep venous thrombosis and any possibility of such embolism.

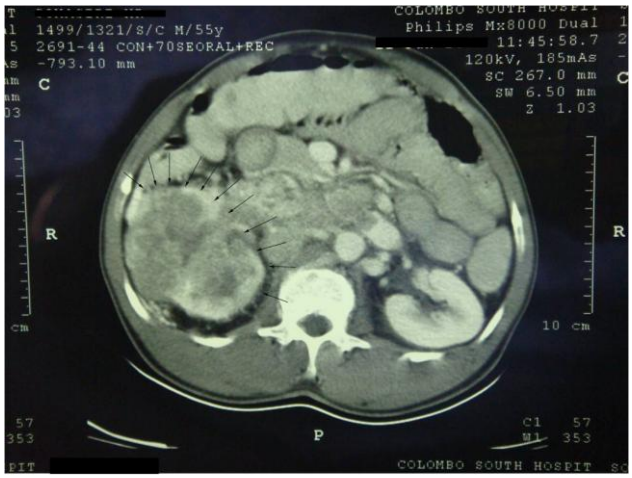
## Conclusion

This case elaborates the rare incidence of a death of a 45 year old male due to pulmonary embolism of a renal cell carcinoma during nephrectomy. The medico legal autopsy helped in arriving at the definitive cause of death as well as allaying the anxiety of the relatives of the deceased about the issues associated with intraoperative death and thereby exonerating the surgical team who had done their best to save the life of the patient under the given circumstances. Death following pulmonary tumor embolism is a recognized yet fairly uncommon outcome of renal cell carcinoma.

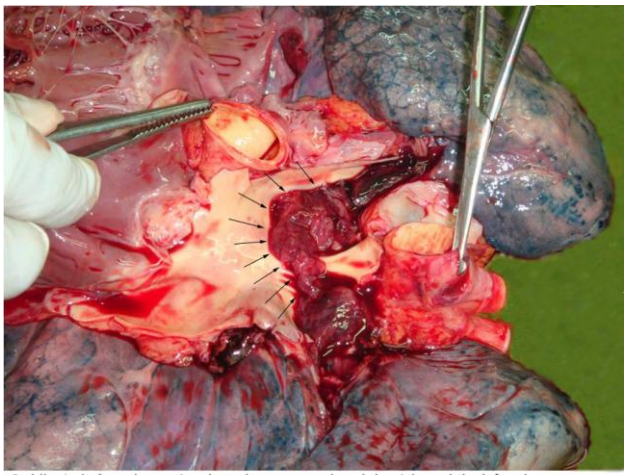
Kidney after removal of the capsule, showing an irregular mass in the upper pole



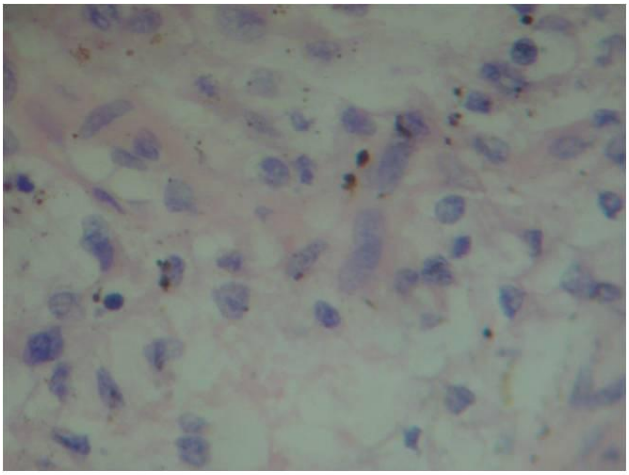
A section through the tumour- note the irregualr, highly vascular, dark red appearance



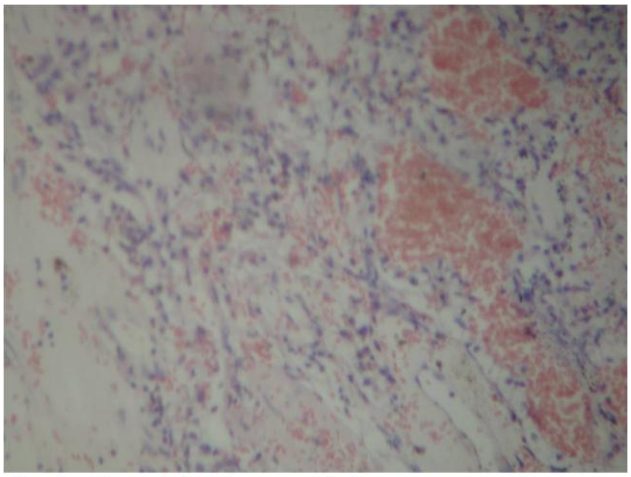

CT showing the involvement of the left kidney



Saddle embolus obstructing the pulmonary trunk and the right and the left pulmonary arteries



Finer details showing the clear cells



Section through the tumour embolus

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# STILLBIRTHS TAKING PLACE IN HOSPITALS - A NEW ACADEMIC EXERCISE FOR SRI LANKAN FORENSIC PATHOLOGISTS -

**S.M.H.M.K. Senanayake**
*Consultant Judicial Medical Officer, Teaching Hospital, Kurunegala.*

## Introduction

Service of Sri Lankan forensic pathologists are mainly sought for unnatural deaths and sudden natural deaths. Even though natural sudden deaths comprise the majority of medico-legal autopsies in Sri Lanka, in-depth analysis of such by a medical team (with ancillary investigations) is occasionally demanded because of less further actions after the inquest. However, recent frequent requests by obstetricians for inquests in stillbirths (happens in hospitals) has widened the team approach in forensic pathology field in Sri Lanka.

Stillbirths are registered in Sri Lanka if maturity is beyond 22 weeks. In international classification of deaths, World Health Organization defines stillbirths as the death of a fetus that has reached a birth weight of 500gm or if birth weight is unavailable, gestational age of 22 weeks or crown to heel length of 25cm[1]. Stillbirths can be antenatal (inside uterus before commence of delivery) or intrapartum deaths (during delivery)[2].

## Indications for autopsies

Autopsies of stillbirths are requested by inquirer of sudden deaths through inquests (legal inquiry of sudden deaths) or as a pathological autopsy (hospital autopsy requested by medical officers). Stillbirths that take place outside of hospital are routinely referred for inquests because of the necessity for exclusion of infanticides. Intrapartum neonatal deaths are usually referred for inquests as a safety precaution for possible allegation of medical negligence. Antenatal stillbirths had not been referred for inquests or pathological autopsies in the last decade. However stillbirths taking place in hospitals are recently being investigated for academic interests. Obstetricians and relations are interested to know as to what had happened to the fetus? What could have been done in order to prevent? And what might happen in next pregnancies and so on?

## Pre-autopsy preparation

Collection of all relevant data is the most important step. Bed head ticket of the mother, antenatal clinic notes, investigation reports and detailed history of the mother are minimum requirements.

Discussions among the obstetrician, pathologist, pediatrician and forensic pathologist will bring up the areas where attention is most needed. Sometimes further reading before commencing the autopsy may be vital[3].

## Autopsy examination

Thorough autopsy with external examination, opening of body cavities, organ dissections with special attention to congenital abnormalities and estimation of maturity should be performed. Postmortem findings belong in to a cause/causes of death and the effects of that cause should be specially looked for. Knowledge on causes of stillbirths, mechanisms and postmortem findings are essential for the forensic pathologist.

Macerated stillbirths are clearly ante-partum stillbirths and those changes will help to estimate time duration of the dead of the fetus inside the uterus [4]. Caput

succedaneum on presenting part will indicate that the fetus had been alive while delivering. Absence of changes due to respiration will establish the stillbirth recorded in hospital documents. But artificial respiration can produce artifacts.

## Causes of stillbirths

Causes could be commonly natural or infrequently unnatural.

## Unnatural causes

Trauma to the fetus or maternal passage, chemicals, poisons and deliberate induction of premature delivery to cause natural death due to prematurity are well known unnatural causes. Road traffic accidents and falling down stairs are common among traumatic causes. Attention for the injuries in newborn's body, investigations for chemicals and poisons will help to exclude majority of unnatural causes.

## Natural causes

Spontaneous causes are divided in to five groups.

A- maternal causes
B- placental causes-
C- fetal causes
D- problems during delivery
E- Sudden antenatal death syndrome- this is a new group proposed by Cacciatore and Collins in year 2000[5]. Real causes will be apparent in future with the advancement of investigations.

### *A - Maternal causes*

- Preeclampsia, HELLP syndrome, acute fatty liver of pregnancy.
- Recreational drugs, alcohol, nicotinic, drug abuse, contraindicated drugs in pregnancy.
- Rhesus diseases
- Past dates- more than 42 weeks of gestation
- Irradiation therapy.
- Chronic illnesses like Diabetes, hypertension, renal disorders, liver diseases, thyroid diseases, systemic lupus erythematosus and bleeding disorders.
- Ante-partum hemorrhage
- Anemia
- Polyhydramnios
- Infections :
  rubella, influenza, toxoplasmosis, syphilis, Malaria urinary tract infection, listeria monocytogenes [6] (bacteria found in meat able to cross placenta), Maternal flora (Group B staphylococci, enterobacter, enterococci, esherichia coli, mycoplasma, streptococci, ureaplasma)
- History of previous stillbirths
- Low birth weights
- Genetic diseases in family
- Maternal obesity

### *B - Placental causes*

- Separation of placenta to early from uterus (placental abruption)
- Large placental infarction
- Placental infections
- Thrombosis
- Circulatory disorders :
  fetal thrombotic vasculopathy and stem vessel thrombosis, fetal vascular narrowing, hemorrhagic endovasculitis, subchorionic fibrin deposition, perivillous fibrin deposition, intravillous fibrin deposition, massive basal plate fibrin deposition, massive parenchymal fibrin deposition[7].
- Placental calcification and premature ageing due to smoking, nanobacteria, diabetes and hypertension

### *C - Fetal causes*

- Bacterial infection like pneumonia, specially when there is dribbling of mother.
- Congenital abnormalities in cardiovascular system.
- Congenital abnormalities of central nervous system:
  Anencephaly, Craniorachischisis, Holoprosencephaly,

Hydranencephaly, Hydrocephalus, Microcephaly.

- Chromosomal aberrations, trisomes.
- Intrauterine growth retardation.
- Dawn's syndrome, Edward's syndrome.
- Iso-immunization.
- Hydrops fetalis due to alloimmunization and Hydrops of unknown origin.
- Fetal haemorrhage such as feto-fetal, feto-maternal and inside the fetus[8].

***D - Problems during delivery (intra-partum causes)***

- Prolonged labor
- Obstructed labor
- Mal-presentations
- Intrapartum asphyxia due to prolong labor, meconium aspiration or umbilical cord compression[9].
- Intra cerebral hemorrhage mainly subdural hemorrhage :

  May be due to delivery, instrumentation or vacuum extraction. Rupture of bridging veins, tears of falx cerebri and tentorium are the causes for subdural hemorrhage[8].
- Fetal respiratory failure due to unknown cause
- Prolapsed umbilical cord
- Short umbilical cord (less than 30cm) can be compressed, constricted or ruptured
- Umbilical cord entanglement- cord wrap around extremity, body or neck of the fetus or knotted itself[10]. Entanglement of cord can constrict blood vessels of cord as well as blood vessels of fetus such as neck veins.
- Torsion (twisting umbilical cord around itself).
- Entangled umbilical cords in mono amniotic twins.

When umbilical cord around round neck causing constriction is explained at the inquest, non-medical people such as lawyers and relations are reluctant to accept it because fetus doesn't respire, depends on maternal circulation and arterial constriction need moderate pressure. It is difficult to explain slight pressure around neck cause constriction of neck veins leading to cerebral ischemia and death.



In teaching hospital Kurunegala, intrauterine growth retardation, obstructed delivery due to large babies, congenital heart diseases (single ventricle), hepatomegaly, and negative autopsies were the findings in autopsies of stillbirths occurred in the hospital.

Since this is a new area in forensic pathology several practical problems are also currently observed. They are;

1. Unavailability of history and health notes– tracing of all health documents and history of mother are very important. If the mother cannot attend the inquest, visiting the mother's ward and obtaining the history is vital.
2. Familiarity about nature of organs and size with weight are important to exclude artifact.
3. Unavailability of investigation facilities.
4. Lack of postmortem findings of lot of causes of stillbirths.
5. Unavailability of placenta during autopsy.

## Conclusion

Even though an autopsy of stillbirth happened in hospital is a new academic challenge, multi disciplinary approach with thorough autopsy dissection of body and placenta, detailed history and investigations can ascertain cause of death or at least probable cause of death in majority of cases. In remaining autopsies identification of risk factors may be achievable. Percentage of negative autopsies will be invariably high for hospital stillbirths in all institutions. Pre-autopsy preparation including tracing all maternal health documents, maternal history and team discussion is the most important step. Exclusion of foul play except induction of premature delivery is an achievable task with the help of history, exclusion of injuries and poisons.

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# UTILITY OF POSTMORTEM VITREOUS BIOCHEMISTRY



**[1] P. Paranitharan & [2] *Michael S. Pollanen**

*[1]Department of Forensic Medicine, Faculty of Medicine Ragama &*
*[2*] Provincial Forensic Pathology Unit, Office of the Chief Coroner, Ontario, Canada and*
*Department of Laboratory Medicine and Pathobiology, University of Toronto*

## Introduction

The analysis of chemical constituents of the body fluids is useful in many deaths due to metabolic and biochemical disturbances. Indeed, postmortem vitreous biochemistry has been studied in the past in relation to both determining the cause and time of death. Much of the reported work was concentrated on the latter by analyzing the rising potassium levels with postmortem interval. There are different formulae available to calculate the time period following death.[1-4].

Postmortem vitreous analysis for biochemical disturbances that may have caused death is more useful and is widely utilized in medicolegal practice. Little has been published in this area since the early 1990s.[5] A recent study addressed the problem defining reference values in vitreous fluid as mirror of blood.[6] However, the vitreous fluid is a well protected fluid. It is less subjected to putrefaction and contamination compared to other body fluids, the postmortem biochemical changes occur slowly in the eye, and the fluid can be easily obtained. Thus, the vitreous fluid is an important substrate for analysis.

We present the results of a retrospective study to determine the utility of vitreous fluid analysis in medicolegal autopsies in which the vitreous sample was sent for analysis. We conclude that postmortem vitreous biochemistry is useful in selected cases of diabetes mellitus and renal disease but it is not likely cost effective to perform postmortem vitreous biochemistry if only for exclusionary purposes.

## Materials and Methods

One-hundred consecutive cases of medicolegal autopsy from the Toronto Forensic Pathology Unit at the Office of the Chief Coroner for Ontario were used for this retrospective study. In each case, the vitreous fluid was collected using a standard collection technique and sent to a clinical biochemistry laboratory for quantities of sodium, potassium, chloride, urea, creatinine, glucose and the presence of ketones. In the other eight cases, the pathologist only requested ethanol determination, thus biochemical testing was performed in 92 cases. The vitreous biochemical results were classified using Coe's criteria for the: *dehydration pattern* (concomitant increase in sodium and chloride with a moderate elevation of urea nitrogen; $Na^+$ > 155 meq/L, $Cl^-$ > 135meq/L, Urea > 40mg/dl); *uremic pattern/renal failure* (urea nitrogen and creatinine levels are appreciably increased without a corresponding increase in sodium and chloride values with urea > 150 mg/dl); *low salt pattern / hyponatremia* (low sodium and chloride with relatively low potassium; $K^+$ < 15 meq/L, $Na^+$ < 135 meq/L, $Cl^-$ < 105 meq/L); *decomposition pattern* (low sodium and low chloride but there is accompanying high vitreous potassium > 20 meq/L); and *diabetic ketoacidosis pattern* ( elevated levels of glucose with presence of ketones; glucose > 200mg/dl).

In each case the vitreous fluid analysis was determined to provide information in one of three categories: (i) contributory to the cause of death (results clarified the cause of death); (ii) non-contributory to the cause of death (results analysis provide no information that influenced decision about the cause of death); or (iii) exclusionary evidence (the lack of a detected abnormality provided influence the decision on the cause of death, e.g., exclusion of diabetic ketoacidosis).

## Results



***Table 1*** *– Analysis of Vitreous Fluid Reports*

| Vitreous Fluid Pattern | Number |
|---|---|
| Exclusionary evidence | 62 |
| Renal failure | 10 |
| Diabetic ketoacidosis | 9 |
| Decomposition | 7 |
| Hyponatremia | 3 |
| Dehydration | 1 |

The following figures illustrates whether the analysis of vitreous humor is helpful in formulating the final cause of death.

***Figure 1***

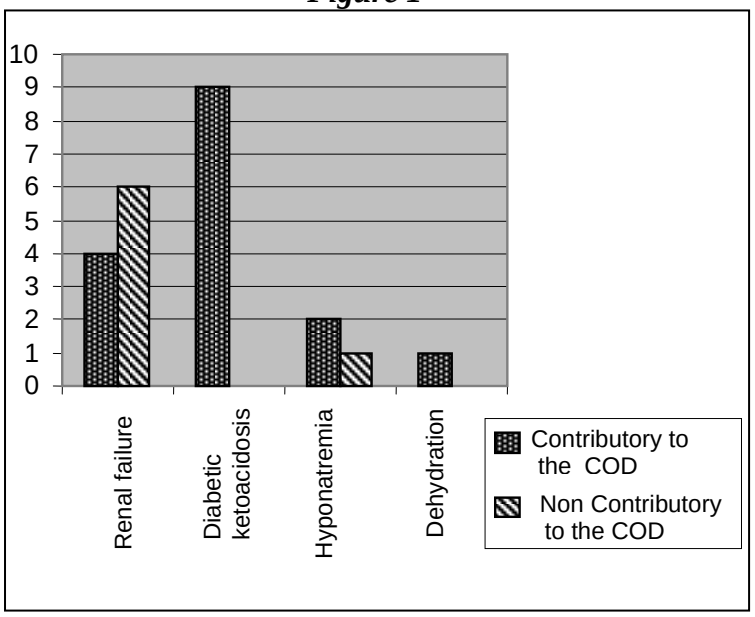
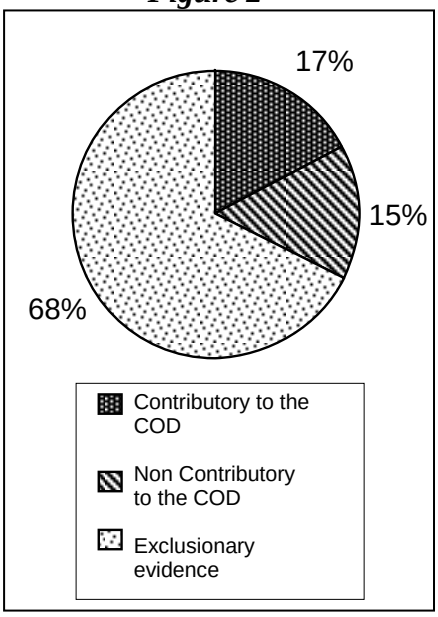



***Figure 2***




## Discussion

The vitreous humor and the forensic applications is still an area of interest to many who are involved in medico legal autopsies. Coe has done extensive research and he had formulated several guidelines, based on which the results of the biochemical analysis on vitreous were studied.[5] But currently there are not much new data added in the vitreous studies. The scope of the study is to see how effective and useful the results of vitreous analysis in formulating the final cause of death.

The data was analysed considering two important factors. Whether the electrolytes levels helped in arriving a cause of death, and the category in which they are grouped according to Coe's checklist. Out of the hundred results eight were not included

because they mainly considered the ethanol levels and not electrolytes.

According to table 1 the majority (68%) of the results does not fall into any of the categories according to Coe. The values are within normal range and they were ordered by the pathologists as exclusionary evidence to rule out any existing diseases based on information in the history and incidental autopsy findings. They were not ordered merely to find the cause of death where the anatomical findings are negative, e.g; diabetic ketoacidosis

If we analyse the different patterns like the renal failure, diabetic ketoacidosis, hyponatremia and dehydration pattern they are contributing to the cause of death (*Figure:1*) but not all of them. In cases of diabetic ketoacidosis almost 100% are contributing to the cause of death. A pathologist who doesn't have a significant anatomical finding for the cause of death or highly suspicious of diabetic ketoacidosis is successful in incorporating the vitreous humor findings in the cause of death statement or as the sole cause of death. Out of ten cases of renal failure four cases contributed to the final cause of death. Almost all of them were incorporated in the final death statement along with other contributing factors and not as a sole cause of death. In other six cases there were other significant anatomical causes or toxicological findings were present. Therefore they were not incorporated in the final cause of death. In the hyponatremia pattern, out of three cases two were incorporated. In the dehydration pattern it was not incorporated in the cause of death statement but it had a significant contribution towards arriving at a final cause of death statement.

Even though as an overall the value of doing a vitreous humor analysis is for exclusionary evidence. (*Figure :2*) The analysis was very useful in suspected diabetic cases. (*Figure:1*)

In cases of exclusionary evidence almost all the cases had a definite anatomical cause of death or they were part of screening drug intoxication and the cause of death was due to drug intoxication. Some cases were unascertained.



The other issues involved in this is how cost effective in ordering vitreous humor as exclusionary evidence in cases where there is definite anatomical cause of death. This is to just confirm the existence of a disease from the history or autopsy findings. From this study it is clear that majority of reports came as normal.

In conclusion in selected diabetic cases and kidney diseases where the suspicion is high in arriving at a cause of death the probability of getting a positive report is very high. Whereas there is less value and less cost effective in ordering vitreous studies when a definite anatomical cause exists and just for exclusionary purposes.

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