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Original Article

Evaluation of Histologic Changes of the Human Salivary Glands in Post-mortem Period: A Preliminary Study

Rajesh Bardale

Abstract

Background: Estimation of time of death is one of the important concerns in autopsy practice. Utility of postmortem autolytic changes occurring in the tissues and tissue fluid for estimation of postmortem interval had been evaluated by number of researchers with varied success. **Aim**: The purpose of present preliminary study was to analyze morphological changes in salivary glands and to identify morphological parameters that could help in determining the time of death. **Material and method**: The study consists of 20 human cadaver comprising 14 male and 6 females and their age ranged from 19 years to 42 years. At autopsy, submandibular salivary glands were collected from the submandibular area through the longitudinal midline incision and subjected for light microscopy. **Result**: The results of present study show that the submandibular salivary glands undergo variable morphological changes in the postmortem period and these cellular changes can be observed by light microscopy. **Conclusion:** Currently there is very limited scientific information available regarding the postmortem autolytic process of salivary glands. Further studies involving cold environmental condition may be productive as it was noticed that mucous acini offer greater resistance for autolysis than serous acini and duct cells.

Keywords: Autopsy; Death; Post-mortem interval; Time since death; Salivary gland.

Introduction

Estimation of time of death is one of the important concerns in autopsy practice. Utility of postmortem autolytic changes occurring in the tissues and tissue fluid for estimation of postmortem interval (PMI) had been evaluated by number of researchers. Various tissues such as heart, liver, kidney, uterus, skin, and its appendages, labial mucosa, gingival epithelium and body fluids such as blood cells and cerebrospinal fluid cells were studied with varied results.[1-16]

Except for few studies on human and animals[17-21], salivary glands in human cadaver have not been thoroughly evaluated for the purpose of estimation of PMI. Furthermore environmental factors such as temperature and humidity, and postmortem period seem to be important factors affecting the salivary glands in postmortem period. Therefore these aspects also need consideration. The purpose of present preliminary study was to analyze morphological changes in salivary glands and to identify morphological parameters that could help in determining PMI.

Materials and Methods

The study was conducted at Department of Forensic Medicine, Govt. Medical College and Hospital, Nagpur from April 2011 to May 2011. The study consists of 20 human cadaver comprising 14 male and 6 females and their age ranged from 19 years to 42 years (mean

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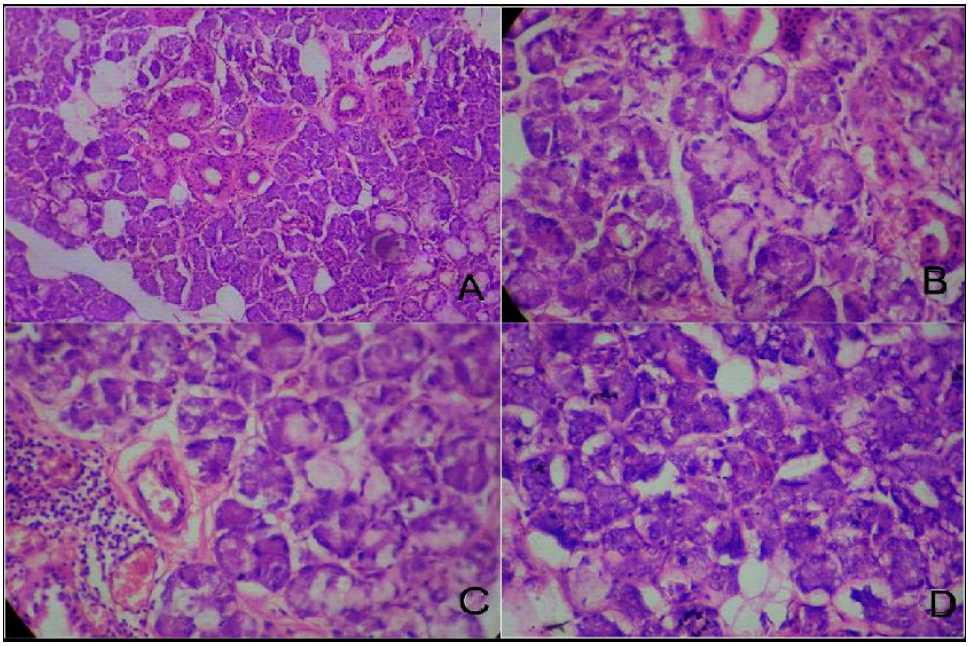
age 31.65 years, SD7.60).The death was due to various causes (head injury, n = 12; intracranial hemorrhage, n = 3; consolidation, n = 4; ischemic heart disease, n =1). The bodies were kept at room temperature in the waiting room of mortuary. The average ambient temperature during the period varied from 37° C to 38° C and average humidity ranged from 28% to 37%. At autopsy, submandibular salivary glands were collected from the submandibular area through the longitudinal midline incision.The submandibular gland samples were carefully taken to avoid traumatic artifact. All samples were collected from those bodies where actual time of death was known. All samples were subjected to light microscopy. Tissues were fixed in 10% formalin, embedded in paraffin wax and stained with hematoxylin-eosin (H and E). The salivary glands were observed for mucous acini, serous acini and various ducts. We have excluded cases where there was 1) trauma to face and mandible, 2) acetylcholinesterase inhibitor poisoning and 3) bodies that were kept in cold storage. The cases were divided into 3, 6, 12 and 24 hour interval after death. Only one sample of salivary gland was collected from each cadaver preferably from left side. However, no attempt had been made to note the difference between right and left salivary gland and PMI.

Results

Before proceeding further, it would be beneficial to revise briefly the normal histology of submandibular gland. Salivary glands are compound tubule-alveolar glands. The secretary elements are called as acini or alveoli. The acini lead into a series of ducts such as intercalated ducts, intralobular ducts and interlobular ducts. On microscopic

Fig 1: Microphotographs showing Section Through Salivary Gland. A-3 Hours: Mixed Acini showing Serous Cells having Granular and Vacuolated Cytoplasm, Mucous Cells Intact, Nuclei of Both Acini Pyknotic and Duct Cells shows Focal Disruption of Cellular Integrity with Pyknotic Nuclei. (H and E, X 40); B-6 Hours: Mixed Acini showing Intermediary Stage of Autolysis, Acini shows Vacuolated Cytoplasm and Duct Cells shows Focal Disruption (H and E, X 40); C-12 Hours: Serous Acini Cell Ruptured with Nuclei showing Pyknosis and Karyorrhexis, Mucous Cells Begin to Rupture (H and E, X 40); D-24 Hours: shows Stage of Advanced Autolysis with Disorganized Glandular Structure with Ruptured Serous Acini Dispersed amongst Mucous Acini (H and E, X 40)



examination one can observed closely packed acini with duct scattered between them and supported by connective tissue. The cells lining the acini are either serous or mucous. On H and E staining, serous cells stain dark because of zymogen granules while mucous cells stain light. In submandibular gland both serous and mucous acini are present. The mucous acini are frequently capped by serous crescents or demilunes. [22]

The results of present study show that the submandibular salivary glands undergo variable morphological changes in the postmortem period and these cellular changes can be observed by light microscopy.

By the PMI of 3 hours, morphological cellular elements showed initiation of degenerative process. The section shows mixed population of serous and mucous acini. In most of the cases (n = 16, 80%), cytoplasm appeared granular while in few vacoulation was evident in serous cells. The cytoplasm of mucous cells appeared normal. The nuclei appeared pyknotic in both type of acini. In few cases (n = 5, 25%) the cellular integrity appeared disrupted focally in duct cells with nuclei appeared pyknotic (Fig 1 A).

During PMI of 3-6 hours, nearly all the acini exhibited intermediary stage of autolytic degeneration. In most of the cells of serous acini the cytoplasm was vacuolated while in few cases, the cell membranes were disrupted focally. The nuclei appeared pyknotic. Mucous cells showed changes in cytoplasm that varied from granulations to vacoulation with pyknotic nuclei. The cell membrane appeared intact. The duct cells showed focal disruption of membrane with pyknotic nuclei (Fig 1 B).

During PMI of 6-12 hours, a mixed picture was noted. Most of the cells of serous acini(n = 18, 90%) were ruptured with nuclei showed pyknosis and karyorrhexis. Mucous cells began to rupture and showed pyknotic nuclei. The duct cells showed disruption of membrane with nuclei showed pyknosis and karyorrhexis (Fig 1 C).

With advancing PMI at 12-24 hours, a stage of advanced autolysis was evident with complete disorganization of the glandular structure with ruptured and disrupted serous acini was noted. The nuclear changes consisted of pyknosis and karyorrhexis. Mucous acini could be identified admixed the disintegrated serous acini. The nuclei were pyknotic. The duct cells showed near complete disintegration of cellular integrity. The nuclei showed pyknosis and karyorrhexis (Fig 1 D).

Discussion

In biological structure, cells are considered as dynamic and complex structures. Cellular death is a state of irreversible injury. After death cellular disintegration occurs in phased manner due to autolysis. The rate of autolysis varies from organ to organ and depends upon number of factors including the hydrolytic enzymes content of the cell. Therefore these autolytic cellular changes have been investigated by forensic pathologist in an attempt to find markers that may assist in determining the time of death.[21]

As far as English literature is concerned, few studies were published related to evaluation of salivary glands in postmortem period.[17-21] Azevedo *et al* (2005) and Moreira *et al* (2006) had studied these glands to assess the age-related differences in the sublingual glands. Tekeda *et al* (1986) studied salivary glands for ascertaining the importance of focal lymphocytic infiltration whereas Dixit *et al* (2001) examined the salivary glands in hanging cases to know whether changes that occurred in these glands may assist to know antemortem nature of the ligature mark. [17-20]However, these studies did not evaluate the salivary glands for the purpose of finding parameters that may assist in determining the time of death. Nery *et al* (2010) had analyzed and quantified morphological acinar postmortem changes in sublingual glands of rats. Aciner autolytic changes were studied at 0, 3, 6, 12 and 24 hour postmortem period. At 0 hour PMI, the glandular structure was found intact. However, with advancing PMI loss of cell limit integrity, granulations in

cytoplasm and nuclei alterations were noted. At PMI of 24 hour, total disorganization of the glandular structure was evident.[21]

Considering the present study, we have sequentially studied the histologic changes in the salivary glands in same environmental conditions with average ambient temperature varied from 37 °C to 38 °C and average humidity ranged from 28% to 37%. With advancing PMI, it was observed that the submandibular salivary gland undergoes variable degree of morphological changes in comparison with progressive morphological changes observed in other body tissues and body fluid.[1-16] By the PMI of 3 hours, the autolytic changes began in serous acini and duct cells. With advancing PMI, the autolytic processes appear accelerated with erratic morphological changes. As the death interval prolonged, the cytoplasm appeared granular and then vacuolated. The nuclear changes consisted of pyknosis and karyorrhexis. The cells began to lose cellular integrity. Eventually there was disintegration and disorganization of morphological features of the gland within 24 hours of death. Moreover, it was noted that mucousacini offer greater resistance to autolysis than serous acini and duct cells.

The findings of the present study are in accordance with findings observed by Nary *et al* (2010) on rat sublingual salivary glands. However, the cellular autolytic changes in present study appear little bit earlier than those of Nary *et al* (2010). The difference could be attributed to environmental difference or biological differences. Environmental temperature is one of the important factors that affect the autolysis. The present study was conducted in hot months of the year and therefore the autolytic changes might have occurred earlier. As far as biological difference is considered, the present study examined human cadaver submandibular salivary glands whereas Nary *et al* (2010) had utilized rat sublingual salivary glands. Apart from environmental temperature, probably this might be one of the reasons for early autolytic change. If biological difference is considered as one of the factor affecting autolytic change then it could be suggested that a different rate of autolysis exists between human cadaver and rat or animal cadaver. The difference in rate of autolysis might be and partly because of difference in metabolic activity or due to difference in enzymatic activity of cells.

In contrast to present observations, where it was observed that autolytic changes occur earlier in serous acini and duct cells,Azevedo *et al* (2005) and Moreira *et al* (2006) had noted delayed autolytic changes in duct cells in comparison with acini cells.[17,18] The variation in autolytic changes in human salivary glands may be attributed to environmental difference.

Currently there are limited scientific information available regarding the postmortem autolytic process of salivary glands. This study is amongst the few studies that had utilized autolytic changes in human salivary glands for determining time of death. [17-21] However, this study is limited by small sample size and evaluation of histologic changes in a common environmental setting. Further studies are required to evaluate these alterations and characterize the postmortem changes in different environmental changes before one could leave such topic because of earlier occurring autolytic changes as observed in the present study.

In view of findings observed in present preliminary study, it can be concluded that the morphological changes in human submandibular gland do not exhibit potential to estimate time of death in early postmortem period. In hot environmental conditions, the autolytic changes occur earlier and the changes are erratic one and hence preclude for proper interpretation and application. However, studies involving cold environmental condition may be productive as it was noticed that mucous acini offer

greater resistance for autolysis than serous acini and duct cells.

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Original Article

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A Hospital Based Study: Mortality among Patients of Pulmonary Tuberculosis

Vivekanand N. Waghmare*, Alm Shaikh, Kailas Pawar*****

Abstract

Tuberculosis remains a major global health problem. Tuberculosis is one of the leading cause of deaths in developing countries. The present study was conducted to assess risk factors and causes of death in pulmonary tuberculosis patients. A retrospective study was conducted in pulmonary tuberculosis patients admitted in hospital and died during treatment period from 2008 to 2012. Medical records of tuberculosis cases over the 5-year period were reviewed and death data were analyzed. Of total 2648 cases initiated on anti-TB treatment, 223 cases (8.42%) were died during treatment. Risk factors in patients who died due to pulmonary tuberculosis were: alcoholism, HIV, baseline weight < 30 kgs, smoking, diabetes, chronic renal failure and steroid use. Alcoholism was found as significant risk factor in 119 (53.36%) patients. Of the 223 deaths, 201deaths (90.13%) due to pulmonary tuberculosis and 22 (9.86%) deaths were due to other than tuberculosis. Bilateral extensive pulmonary tuberculosis was the cause of death in 163 cases (73.09%). Out of 223 deaths, 188 (84.30%) deaths occurred within 2 months of therapy due to tuberculosis. Overall, alcoholism and late presentation both contributed substantially to the mortality in this cohort. active case finding can reduce tuberculosis mortality rate by earlier case detection and treatment.

Keywords: Pulmonary tuberculosis; Risk factor; Mortality; Cause of death.

Introduction

Tuberculosis (TB) is an airborne infectious disease that is preventable and curable. It ranks as the second leading cause of death from an infectious disease worldwide, after the human immunodeficiency virus (HIV).[1] According to latest World Health Organization (WHO) report 9 million new cases and 1.4 million TB deaths occur worldwide annually. In study of the natural history of the disease among sputum smear-positive and HIV-negative cases of pulmonary TB, around 70% died within 10 years; among culture-positive (but smear-negative) cases, 20% died within 10 years.[2]

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In 2011, 2.3 million cases were estimated to have occurred in India. With the introduction of Directly Observed Treatment Short Course (DOTS) strategy in India in 1997, total burden of tuberculosis and mortality rate reduced significantly but deaths due to tuberculosis continue to occur. Treatment outcomes of pulmonary tuberculosis cases reported that death rate of 5% in new sputum-positive cases, 7% to 8% in smear positive re-treatment cases during period from 1999 to 2011 in India.[3] The aim of the present study is to evaluate mortality in pulmonary tuberculosis patients with objectives of assessment and determination of risk factors, causes of death in pulmonary tuberculosis patients. Knowing these risk factors and reducing them will decrease mortality rate of tuberculosis.

Aims and Objectives

To assess risk factors in patients died of pulmonary tuberculosis.

To determine the causes of death in patients with pulmonary tuberculosis.

Methods

After institutional ethical committee approval, a retrospective study was conducted in department of pulmonary medicine, Dr.V M government medical college, Solapur. We have studied indoor paper record to determine the proportion of TB patients who died during therapy. Risk factors and causes of deaths in 223 patients died with pulmonary tuberculosis were determined. Medical records of all pulmonary tuberculosis patients admitted in our hospital during the period of January 2008 to December 2012 were analyzed. We have included all patients who died in hospital during treatment period with diagnosis of pulmonary tuberculosis. We have excluded patients of pulmonary tuberculosis with age < 18 years. Diagnosis of Pulmonary tuberculosis was made with clinical finding, microbiological and radiological methods. Pulmonary tuberculosis cases are divided into Smear-positive and Smear-negative cases. Smear-positive pulmonary tuberculosis is patient with one or two smears being positive for acid fast bacilli (AFB). Smear-negative pulmonary TB is patient with symptoms suggestive of TB with two smear examination negative for AFB, with evidence of pulmonary TB by microbiological methods (culture positive or by other approved molecular methods) or Chest X-ray. Cases were classified as new, relapse, treatment after default and failure case. New case is patient who has never had treatment for TB or has taken anti-TB drugs for less than one month. Treatment after default is patient, who has received treatment for TB for a month or more from any source and returns for treatment after having defaulted consecutively for two months or more and found to be smear-positive. Failure is patient who is smear-positive at 5 months or more after initiation of treatment. Relapse case is patient who was declared cured or treatment completed by a physician and who reports back to the health facility and is now found to be sputum smear positive. Patient who died during the course of treatment regardless of cause is declared as Died case.

The following information was obtained from indoor case papers: age, sex, weight, addictions, type of case, category of treatment, other medical illness, HIV serostatus and cause of death. Data was entered into Microsoft office excel 2007 and were analyzed using SPSS.

Results

Of total 2648 cases admitted and initiated on anti-TB treatment, 223 cases (8.42%) were died during Treatment. out of 223 patients of pulmonary tuberculosis 161 (72%) were male and 62 (28%) were female. 103(46.18%) patients with age between 18-39 years, 93(41.70%) patients with age between 40-60 years and 27 (12.10%) patients with age >60 years were found. 48 (21.52%) patients with weight < 30 kgs and 175 (78.47%) patients with weight > 30 kgs were found (table 1). Risk factors in patients died due to pulmonary tuberculosis were: alcoholism, HIV, baseline weight < 30 kgs, smoking, diabetes, chronic renal failure and steroid use. 119 patients (53.36%) alcoholic, 48 patients (21.52%) with baseline weight < 30 kgs, 8 patients (5.80%) diabetic, 5 (2.24%) smokers, 1 patient (0.44%) with Chronic renal failure, 1 patient (0.44%) using steroids and 41 patients (18.30%) were human immunodeficiency virus (HIV) positive

Table 1: Sex, Age and Weight Distribution in Patients with Pulmonary Tuberculosis

		Numbers (223)	Percentage
Sex	Male	161	72%
	Female	62	28%
Age	18 – 39 yrs	103	46.18%
	40 – 60 yrs	93	41.70%
	>60 yrs	27	12.10%
Weight	<30 kg	48	21.52%
	>30 kg	175	78.47%

Table 2: Risk Factors for Mortality in Patients with Pulmonary Tuberculosis

Risk factor	Numbers (n=223)	Percentage
Alcoholism	119	53.36%
Baseline weight <30 kg	48	21.52%
HIV status	41	18.30%
Diabetes	8	5.80%
Smoking	5	2.24%
Chronic renal failure	1	0.44%
Steroid use	1	0.44%

Table 3: Classification of Patient with Pulmonary Tuberculosis

Type of case	Numbers (n=223)	Percentage
New cases	121	54.26%
Defaulters	81	36.32%
Relapse cases	18	8.07%
Failure cases	3	1.34%

(table 2). Out of 223 pulmonary tuberculosis patients, New patients were 121 (54.26%) and 102 (45.73%) patients were retreatment cases. Among 102 retreatment cases, 81 (36.32%) defaulter, 18(8.07%) relapses and 3(1.34%) cases were treatment failure (Table 3).

Of the 223 deaths, 201 deaths (90.13%) were due to tuberculosis and 22 (9.86%) deaths due to other than tuberculosis. Bilateral extensive pulmonary tuberculosis was the cause of death in 163 cases (73.09%), among them majority died due to respiratory failure. 4 cases (1.79%) died of massive hemoptysis, 9 cases (4.03%) died due miliary tuberculosis. 14 cases (6.27%) died due to drug resistant tuberculosis. 8 cases (3.58%) died of TB meningitis and 3 cases (1.34%) due to pneumothorax.

Twenty two cases (9.86%) were died of medical problems unrelated to tuberculosis. 11(4.93%) cases from congestive cardiac failure , 3 patients (1.34%) due to sepsis, 2 patients (0.89%) due to pneumonia, 2 cases (0.89%) due to hepatic encephalopathy. 1 case

Table 4: Causes of Death in Patients with Pulmonary Tuberculosis

	Cause of death	Numbers (n=223)	Percentage
Tuberculosis related death	Bilateral extensive pulmonary tuberculosis	163	73.09%
	Drug resistant tuberculosis	14	6.27%
	Miliary tuberculosis	9	4.03%
	Tuberculous meningitis	8	3.58%
	Hemoptysis	4	1.79%
	Pneumothorax	3	1.34%
Non tuberculosis related death	congestive cardiac failure	11	4.93%
	sepsis	3	1.34%
	pneumonia	2	0.89%
	diabetic ketoacidosis	1	0.44%
	hepatic encephalopathy	2	0.89%
	malignancy	1	0.44%
	pulmonary thromboembolism	1	0.44%
	cerebrovascular accident	1	0.44%

Table 5: Time Duration from Treatment Start to Death in Patients Pulmonary Tuberculosis

	Cause of death	time duration < 2 months	time duration 2- 4 months	time duration >4 months
Tuberculosis related death	Bilateral extensive pulmonary tuberculosis	159	2	2
	Drug resistant tuberculosis	8	2	4
	Miliary tuberculosis	9		
	Tuberculous meningitis	5	3	
	Hemoptysis	4		
	Pneumothorax	3		
Non tuberculosis related death	congestive cardiac failure	5	3	3
	sepsis	3		
	pneumonia	1	1	
	hepatic encephalopathy	1	1	
	diabetic ketoacidosis		1	
	malignancy		1	
	pulmonary thromboembolism		1	
	cerebrovascular accident			1

(0.44%) due to diabetic ketoacidosis, malignancy, pulmonary thromboembolism, cerebrovascular accident each (Table 4).

Out of 223 died patients, 188 (84.30%) deaths in period < 2 months, 7 (3.13%) deaths in 2- 4 months period and 6 (2.69%) deaths in period >4 months of treatment due to tuberculosis occurred. 10 (4.48%) deaths in period < 2 months, 8(3.58%) deaths in 2- 4 months period and 4 (1.79%) deaths in period >4 months due to other medical problems in TB patients occurred. Significant number of deaths (71.30%) were due to Bilateral extensive pulmonary tuberculosis in period < 2 months (Table 5).

Discussion

In this study of pulmonary tuberculosis patients, overall mortality during tuberculosis treatment was 8.42%, consistent with death rates reported in annual status report of revised national tuberculosis control programme, India.[3] 90.13% (201/223) of deaths occurred directly due to tuberculosis and 9.86% (22/223) of deaths were not directly due to tuberculosis, but resulted from congestive cardiac failure, sepsis, pneumonia, hepatic encephalopathy, diabetic ketoacidosis, malignancy, pulmonary thromboembolism and cerebrovascular accident. About 50% (11/22) of these deaths due to other medical problems occurred due to congestive cardiac failure. In other TB cohorts worldwide, the proportion of deaths caused directly by Tuberculosis has ranged from 10.5% to 85.6%.[4,5,6,7] Risk factors for death in tuberculosis patients were alcoholism, HIV co-infection, malnutrition (baseline weight < 30 kgs), diabetes, smoking, Chronic renal failure and Steroid use in the present study. Previously reported risk factors for mortality among tuberculosis patients include alcoholism, human immunodeficiency virus (HIV) co-infection, multidrug resistance, irregular treatment and delayed care-seeking. [8,9.10,11,12]

Alcohol has been recognized as a strong risk factor for tuberculosis disease.[13] Reason for

increased risk is due to alteration in the immune system, specifically in altering the signaling molecules responsible for cytokine production.[14] It has been found that alcoholism is one of the major risk factors for treatment non-compliance and mortality in south India.[15] In our study significant number of patients (53.36%) died with pulmonary tuberculosis were alcoholic. Given the high prevalence of alcoholism among Tuberculosis patients in the present study and its contribution to mortality, establishing a systematic approach to screening and treating alcoholism may be useful among Tuberculosis patients and lead to improved treatment outcomes.

HIV co-infection is the most potent immunosuppressive risk factor for developing active TB disease. From different Studies worldwide, it has been observed that high mortality in tuberculosis patients occur in HIV co-infection.[16,17] Prevalence of HIV among estimated incident Tuberculosis patients is about 5% in Indian population.[3] HIV prevalence in pulmonary tuberculosis patients in the present study is 18.30%. This high figure of HIV patients in this study is due to evaluation of data in death patients with pulmonary tuberculosis. we have not evaluated pulmonary tuberculosis patients with HIV co-infection in relation with use of antiretroviral therapy in this study. HIV co-infection in sub-Saharan Africa is high, giving antiretroviral therapy during initial phase of tuberculosis treatment is beneficial in reducing death in HIV co-infected tuberculosis patients.[18]

Malnutrition increases the risk of tuberculosis because of an impaired immune response.[19] Tuberculosis disease can itself lead to malnourishment because of decreasing appetite and changes in metabolic processes. Moderate to severe malnutrition in patients with tuberculosis is associated with early death.[20] In the present study weight <30 kgs was seen in 48 (21.52%) patients reflecting malnutrition. Nutritional support to enhance host response could potentially have a role in reducing mortality in these severely malnourished patients. Cegielski and McMurray reviewed the relationship between malnutrition and tuberculosis with the available ecological, epidemiological, and animal studies and mentioned that although evidence exists to relate malnutrition and TB, the risk relative to specific levels of malnutrition still needs to be defined.[21] Diabetes has been shown to be an independent risk factor for tuberculosis. In this study diabetes was found in 5.80% cases died with pulmonary tuberculosis. About 10% of tuberculosis cases are linked to diabetes. People with diabetes who are diagnosed with TB have a higher risk of death during tuberculosis treatment. It has been argued that good glycemic control in TB patients can improve treatment outcomes.[3]

Majority of tuberculosis related death in this study was due to bilateral extensive pulmonary tuberculosis consistent with the works of Kourbatova *et al* and Tocque *et al*.[10,11] This finding reflects that diagnosis and treatment of tuberculosis are made at the late stage of disease due to missed time of tuberculosis detection with alcoholism as a risk factor. Drug resistant tuberculosis related (6.27%) death was associated with retreatment cases and reflect acquired drug resistance. In the present study majority of deaths directly due to tuberculosis occurred early in the course of treatment, with 84.30% dying within the first 2 months of therapy that reflects delay in diagnosis and starting of treatment. All other patients with pneumothorax, hemoptysis and miliary tuberculosis died within 2 months of therapy reflecting high mortality in these patients. Similar reports of early deaths in tuberculosis patients during treatment period have come from various studies.[22,23] These finding suggest that active case finding is essential to reduce tuberculosis mortality rate by earlier case detection and treatment.

Conclusion

Considering these risk factors for development of tuberculosis and its contribution to death among tuberculosis patients, effective intervention strategies need

to develop for tuberculosis patients. Active case finding for earlier detection and treatment of tuberculosis should be employed so that early deaths in tuberculosis patients during treatment period can be prevented.

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Original Article

Situs Inversus Totalis: A Case of Incidental Autopsy Finding and Review of Literature

Tanuj Kanchan*, Anadi Gupta, Jenash Acharya*****

Abstract

'Situs inversus' is a congenital anomaly where the normal physiological positions of the thoracic and abdominal organs are reversed giving an appearance of a perfect mirror image of the normal anatomical position of the organs. An individual with 'Situs inversus' usually remains asymptomatic throughout life. The diagnosis is usually made out when the individual seeks medical attention for some unrelated condition. An autopsy case of suicidal poisoning is reported where the rare phenomenon of 'complete situs inversus' was observed as an incidental finding. The issues of medicolegal significance associated with this anomaly are highlighted along with review of literature.

Keywords: Situs inversus totalis; Congenital anomaly; Autopsy; Poisoning.

Introduction

'Situs inversus' is a congenital anomaly where the normal physiological positions of the thoracic and abdominal organs are reversed giving an appearance of a perfect mirror image of the normal anatomical position of the organs.[1] The term 'situs inversus' derives its origin from the Latin phrase '*situs inversus viscerum*', which translates to 'inverted position of the internal organs'. In this condition the organs rotate in the sagittal plane resulting in the reversal of abdominal and thoracic organs without any alterations in the anteroposterior relationships. The neurovascular and lymphatic systems may also accompany the changes observed in the respective organs. The phenomenon of 'situs inversus' can be complete or partial, the determining factor being the direction of the apex of heart. Thus, if the apex of the heart is directed towards the right side it is deemed as 'complete situs inversus' or 'Situs Inversus Totalis' and if the apex is in its normal anatomical position, it is called as 'partial or incomplete situs inversus'. Situs inversus, though may appear as a grossly abnormal condition, it does not affect the normal life of an adult and mostly remains asymptomatic. The diagnosis is usually made out when the individual seeks medical attention for some unrelated condition.[2]

An autopsy case of suicidal poisoning is reported where the rare phenomenon of "complete situs inversus" was observed as an incidental finding. Relevant literature is reviewed to highlight on the issues of medicolegal significance associated with this anomaly.

Case Summary

Dead body of a 66 year old male was brought for medicolegal autopsy at our centre. Preliminary police investigations revealed that the deceased had committed suicide by ingestion of an insecticide. Report from the Regional Forensic Science Laboratory (RFSL)

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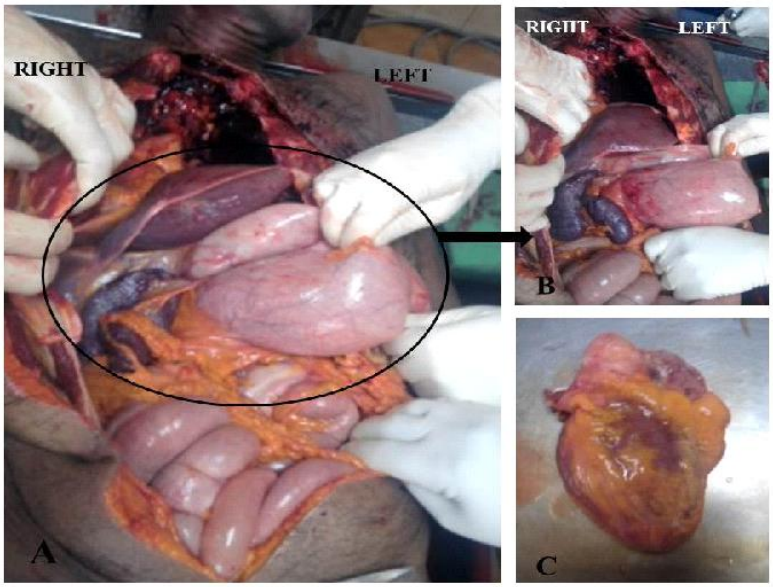
Figure 1: Complete Reversal of Thoracic and Abdominal Organs.Apex of the Heart is Pointing to the Right Side. Liver is Present on the Left Side. Stomach that was on the Right Side is Lifted to show the Underlying Spleen Located on the Right Side (Figure 1 A and B). Figure 1 C shows the Posterior Aspect of Heart



confirmed it as a case of organophosphate consumption. Exact reason for committing suicide was not known. The deceased was a diabetic and investigators believed that he took the extreme step owing to the long standing illness. The deceased survived for approximately 4 hours post insecticide ingestion and autopsy was conducted within 24 hours of his death. During autopsy, it was observed that the deceased was moderately built and nourished. No external injuries were present on the body. Frothy blood mixed fluid was seen coming out of mouth and nostrils. External examination otherwise, was unremarkable. On internal examination, complete reversal of thoracic and abdominal organs was observed. Bilobed and trilobed lungs were present in the right and left pleural cavities respectively. Apex of the heart was pointing to the right side. Liver was present on the left side. Stomach was on the right side and is lifted to show the underlying spleen located on the right side (Figure 1 A and B). Figure 1 C shows the posterior aspect of heart. Right and left lungs weighed 860 grams and 660 grams respectively. Thoraco-abdominal organs were congested.

Discussion

Suicide is an important public health hazard worldwide and elderly men are at higher risk of suicide than women.[3] Poison is a common method of committing suicide in the region.[4] It is observed that insecticides are responsible for most of the suicidal fatalities.[5,6] The present case is another in the series of elderly men who commit suicide by ingestion of insecticides.

Situs inversus totalis is a rare anomaly with an approximate incidence of one in 10,000 to 20,000 among the general population.[7] The condition is asymptomatic and individuals are unaware of this anomaly. The diagnosis of situs inversustotalis is usually accidental. In most cases, situs inversus is diagnosed incidentally during thoracic and abdominal imaging. Isolated situs inversustotalis is reported to be usually asymptomatic in neonates.[8] Situs inversus is known to be a rare autosomal recessive condition. Studies have further observed that situsinversus can be X-linked or even found in identical twins. [9] The etiology of situs inversus is unclear and still being

looked into. The condition is sometimes associated with syndromes such as Kartagener syndrome, cardiac anomalies, and malformations of spleen. Among these, Kartagener syndrome is one of the conditions commonly associated with this anomaly and is characterized by situs inversus, bronchiectasis, chronic sinusitis and infertility. [10]

The condition of situs inversus totalis is associated with diagnostic and therapeutic issues. With regards to its surgical implications, the surgeons are likely to face difficulties due to reverse anatomy during surgeries performed on patients with situs inversus.[11] It is believed that for patients with total situs inversus and cholelithiasis, a left-handed surgeon can carry out the procedure of laparoscopic cholecystectomy more comfortably than a right-handed surgeon.[12] Similarly, issues related to diagnosis and treatment of appendicitis in a patient with situs inversustotalis are discussed in literature. [13] Bajwa *et al*[14] emphasized on the potential difficulties encountered during anaesthetic management and its implications during various surgical procedures in patients with situs inversustotalis.

Acute traumatic conditions with medicolegal significance and disorders requiring acute intervention can surprises the surgeon and patient if the condition is not recognized preoperatively.[2] In cases of poisoning, gastric lavage needs to be performed using a right lateral approach. A successful resuscitation of patients with situs inversustotalis will require a detailed knowledge and skills of applying direct current with defibrillator pads on the right side.[14] Organ transplantation is another challenge associated with this congenital anomaly. Situs inversus is considered as a contraindication for thoracic transplantation as reconstruction of the mirror-image systemic venous pathways to accommodate normal donor organs remains the main difficulty for the surgeons.[15]

Issue of misdiagnosis, wrong diagnosis or complications during diagnostic or therapeutic procedures can bring about allegations of medical negligence. Thus, the importance of correctly identifying this condition is emphasized on. Imaging techniques such as radiography, ultrasonography and computed tomography can confirm its diagnosis and reduce the likelihood of misdiagnosis/ wrong diagnosis. In developing countries with limited access to more advanced imaging techniques especially in rural populations, doctors working at primary health centres should be aware of this condition and thorough a clinical examination with percussion and auscultation of chest and abdomen can be helpful in its diagnosis. The most commonly available and cost effective investigation to confirm diagnosis in such cases will be a chest or an abdominal radiograph.

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Review Article

Essential Precautions in Sample Collection during Medico Legal Work: A Review

Nishat Ahmed Sheikh*, Seema S. Sutay**

Abstract

Biological materials' collection, preservation and analysis are essential procedures in any Medico legal work. Improper collection of these specimens can greatly alter or negate chemical and toxicological analysis. The investigation of a death from suspected poisoning may depend upon the correctness or otherwise of sampling of fluids and tissues from the body. This article is an update about the standard methods of biological materials collection procedures, preservation and analysis which will be helpful for the Medical and forensic doctors.

Keywords: Precaution; Collection; Preservation; Biological materials; Poison; Medico legal cases.

Introduction

There are three main sources from which biological material for examination can be obtained, the scene of the crime, the victim and the suspect and his environment.[1,2] Often poison and drugs are involved in medico legal cases where the identification of drugs and poisons is necessary to establish cause of death. In offences involving the human body (assault, rape, murder, etc.) laboratory analysis of material obtained from the victim or the accused can prove vital to proper investigation of the case. Laboratories meant for chemical analysis are located at a distance from the site of occurrence and one has to transport the specimen here for analysis. The prime requisite in transport is to prevent loss of sample and change in chemical and physical attributes of the specimen so as to avoid misinterpretation of the results.

NCRGSPA (National Committee for Revised Guidelines of Medicolegal Samples Preservation and analysis) has given the following guidelines[1], discretionary power as to whether to have Viscera/body fluids or other biological material analysed in a forensic science laboratory rest with 'Medical Officer' and the Investigating officer. The MO must not collect Viscera/body fluids for analysis as a matter of routine when it is not needed; indulging in such a practice in order to "Buy Time" is unethical and furthermore is indicative of incompetence. Prescribed Forms (Properly filled with relevant details) should be used while forwarding the material. All material should be packed, preserved and sealed properly. Use individualised/ departmental/institutional seal for sealing. The covering letter should bear a specimen seal for reference. All material must be packed in suitable containers and each container should have a label affixed to it mentioning relevant details: Nature and quantity of contents, preservative used, name of the deceased, crime no, police station to which the case belongs, PM No, date, name and designation of the medical officer. The exact type of analysis required, should be mentioned in the covering letter. The exact preservative used as well as

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Table 1: Viscera/Body Fluids to be Preserved in All Cases where Toxicological Analysis is Deemed Necessary

S. No	Material	Quantity
1	Stomach	Entire
2	Stomach content	Up to 300 ml
3	Small Intestine	30 cm (entire length in Infants)
4	Small intestinal contents	Up to 100 ml
5	Liver(portion containing Gall Bladder)	Up to 500 gm (Entire in Infants)
6	Kidneys	One half of each Kidney(Both Kidney in Infant)
7	Blood	10 ml
8	Spleen	½ in Adults (Whole in Infants)
9	Urine	20-30ml.

the quantity should be mentioned in the forwarding letter: e.g. – Sodium citrate 5 mg and 0.1 mg of mercuric chloride mixture for each ml of blood. A sample of the preservative used should also be sent separately.

Preservatives

Viscera

If specimen can reach the laboratory within 48 hours, there is no need to add preservative to the viscera. Following preservatives used if delay: Alcohol/Rectified Spirit, Saturated solution of common salt, solid common salt. Alcohol is the most suitable preservative, except in poisoning by Alcohol and acetic acid.

Note: Never use Formalin as a preservative for sending the viscera to chemical Analysis as it hardens the tissue, renders difficulty to extract poison. In all cases of poisoning, including carbolic acid, saturated solution of common salt should be used as preservative. In cases where poisoning by acids (except carbolic acid), is suspected; rectified spirit should be used as preservative.

Samples for Histopathological examination should be preserved in either 10% formalin / 95 % alcohol. As per dictum the preservative should constitute 10 times the volume of tissue to be fixed.

For Microbiological Investigation: Dry ice is best, do not use preservative such as Formalin or Alcohol, Phosphate buffer can be used such that the final p^H is between 7.2-7.5, for virological examination: 80 % Glycerol in Buffered saline.

Blood: Amount: 10 to 20 ml.

For Chemical Analysis: 30 mg of Potassium oxalate + 50 mg of Sodium fluoride for every 10 ml of blood, Sodium fluoride 20 mg for each ml of blood, 10 gm sodium citrate + 200 mg Mercuric chloride in 100ml distilled water. Use 0.5 ml/10 ml of blood.

For Bacteriology: 10 ml of whole blood in sterile tube with an Anticoagulant (best Sodium polyanethol sulphate), directly placed into a container of culture medium.

Table 2: Important Precautions and Guidelines for the Collection of Physical Evidences for Biochemistry

Sl. No	Sample	Collection
1.	Vitreous Humour	With wide bore needle into syringe, thereafter eyes should be filled with water for cosmetic reasons
2.	CSF	After opening the skull csf should be collected from ventricles

Table 3: Important Precautions and Guidelines for the Collection of Physical Evidence for Microbiology

Sl. No	Sample	Collection
1.	Mucous, pus, secretion smears	All smears should be fixed in alcohol before staining
2.	Blood	Preferably blood should be collected from heart with all aseptic precaution and should be sent immediately or should be stored at 4^0C
3.	Spleen culture	Spleen should be seared with sterile blade
4.	CSF	Through lumbar puncture or cisternal puncture under aseptic precaution

Table 4: Important Precautions and Guidelines for the Collection of Physical Evidence for Identification

Samples	Collection Procedures
1) Blood:	
a) Stained clothes	Air dry, Pack each bloodstained garment separately in dry paper parcels. (Pack in dry moisture resistant paper parcels and not in polythene packets).
b) Blood stained immovable articles	Thick Stain: scrap the stained area using a clean knife/blade into a clean dry paper packet. Alternatively swab the area using sterile gauze cloth wetted with normal saline. Each stain should be collected using separate gauze cloth. Air-dry and pack them separately in dry paper parcel. Unused gauze cloth should be sent as control.
c)Soil impregnated with blood	Superficial blood stained soil should be collected and packed in paper parcel. Adjacent unstained soil should also be sent as control.
d) Liquid blood	To be collected using sterile gauze cloth wetted in normal saline. Unused gauze cloth should be sent as control.
2. Semen	
a) Stained clothes	Air dry and packed in dry paper parcels. Avoid folding, crushing the stained area in the process of packing.
b) Swabs, Vaginal swabs	Air dry the swabs and pack in clean dry glass vial/bottle.
c) From immovable articles	To be collected using a sterile gauze cloth wetted in normal saline. Air-dry and pack them separately in dry paper parcels.
d) Pubic hair; Nail clippings	Air-dry and pack them separately in dry glass bottles.
e) Liquid Semen	To be collected using sterile gauze cloth wetted in normal saline. Air dry and pack in dry glass bottle. Unused gauze cloth should be sent as control
3) Saliva:	
a) Liquid saliva	To be collected using sterile gauze cloth wetted in normal saline. Unused gauze cloth should be sent as control.
b) Cigarette butts.	Air-dried and packed in paper parcels.
4) Skin etc.:	
Tissues found at Crime scene	Collected in a clean glass bottle containing saturated solution of sodium chloride.
5) Bone:	Whole bones like Femur, Humerus, rib bones etc., to be collected and packed in dry paper parcels (or) should be kept in aluminium foil and frozen.
6) Teeth:	Teeth to be packed in dry paper parcel.
7) Hair	Hair samples should be collected with rubber tipped forceps air-dried and packed in a paper packet; pack the weapon along with hair sticking to it carefully in paper packet. Preferably 25 control hair samples and as many crime samples.
8) Fibre	Fibre samples should be collected with rubber tipped forceps and packed in a paper packet Tag and place in polythene covers
9) Insects Dead maggots	To be collected in a sterile bottle containing alcohol
Live maggots	To be collected in wide mouthed bottle with a small piece of flesh inside, allow sufficient aeration.
10) Fascia Lata(for chromosomal Studies)	Should be suspended in serum containing antibiotics.

Table 5: Collection & Storage of DNA Samples

Sl. No	Sample	Collection
1.	**Blood**	Should be collected in sterile vial with EDTA 5 ml of blood in case of adults & 2-5ml in case of children.
2.	Blood stained clothes	Blood stained garments should be thoroughly dried in shade & packed in separate paper packet.
3.	Blood stained articles/weapons etc	Scrape the stained area, keep in paper envelope & seal or swab the stains with sterile gauze cloth soaked with saline, dry and pack separately.
4.	Semen/seminal stains/vaginal swabs	Air dry and pack in separate paper packets.
5.	Hairs	Hair with roots to be air dried and packed in separate paper packets.
6.	Tissues of skin, muscle etc.	Collect in a clean glass bottle Add 20% Dimethyl sulphoxide or sodium chloride.
7.	Bones	Whole bones like sternum, femur, humerus to be collected and packed in separate paper packets and kept in aluminum foil and frozen without any preservative.
8.	Teeth	Teeth should be packed in dry paper packets and sealed (Molar or canine are preferred).

For Grouping: On filter paper, EDTA bulb (3-5 ml).

Urine: Quantity: 20-30ml.

Preservative: 100mg Sodium Fluoride for every 10 ml, Thymol- 0.1gm per 100 ml of urine. Note: For short term preservation refrigeration alone is satisfactory. Collection: Puncturing the bladder with a needle and syringe and aspirate about 20 ml. If less urine, make small incision on the anterior bladder wall, scoop out the urine with a spoon or aspirate it with a syringe or pipette.

Precaution While Collecting Material for DNA: Avoid contaminating the area where DNA material is to be preserved, by not touching it with bare hands, or sneezing and coughing over the evidence. Use clean latex gloves for collecting each item of evidence. Gloves should be changed between handling of different items of evidence. Samples should be packed in paper envelops or paper bags after drying. Plastic bags should be avoided because water condenses in them, especially in areas of high humidity and water can speed the degradation of DNA molecules. Packages should be clearly marked with case number, item number, collection date, and initialled across the package seal in order to maintain a proper chain of custody. Invariably the persons should be directed to FSL for blood collection, but in case they are unable to do so on account of health or age, the sterile vials with preservative may be collected from laboratory. The blood so collected should be labelled and sealed properly and transported in ice so as to reach the laboratory within 24-48 hours. Blood should not be drawn from a person who has undergone blood transfusion till three months. The above precautions and guidelines should be in notice of the medical officer for collection of evidence in an appropriate manner. With every blood sample collected by the medical officer an identification form should be filled up by the individual.

Preservation in Specific Cases[3,4,5]

1. In case of burn victims to determine the levels of carbon monoxide, 10ml of blood sample preserved in liquid paraffin in a glass bottle should be collected and forwarded.
2. Chemical analysis of viscera in case of known cause of death such as electric shock victims and persons known to have died due to diseases like TB, Cancer, Hepatitis, Aids etc. Hence such samples should not be collected for chemical analysis.
3. Similarly it will be of no consequence if chemical analysis of viscera is carried out in case of natural deaths due to starvation, sunstroke, old age, lightning, extreme cold etc.
4. In case of hanging when fracture of hyoid bone concludes death due to hanging, there is no additional advantage in referring the visceral organs for chemical analysis.
5. In case of drowning where the Medical Officer arrives at a definite opinion that the cause of death is due to drowning, no additional purpose will be served by chemical examinations.
6. Testing for Diatoms in visceral organs, spleen & bone marrow may be most useful in cases of drowning. In such case control sample of the water in which body was recovered should be taken in a separate container.
7. In case of snakebite or other insect bites, samples of skin bits of affected area should only be collected and forwarded, with the control samples of opposite site.
8. In cases of hanging, drowning, burns, accidents etc., the Medical Officers may sometimes refer the viscera if any suspicious circumstances arise which are to be noted clearly to conduct proper analysis.
9. In case of deaths due to administering injections the sites of injections, skin subcutaneous tissues along with needle tract weighing about 100 gms should be collected. Similar material from

symmetrical side of the body should also be taken as control in a separate container.

10. In case of inhaled poisons like carbon monoxide, coal gas, hydrocyanic acid, chloroform or other anaesthetic drugs the lung tissues, brain and blood from the cavity of the heart should be preserved and forwarded.
11. Shaft of long bones (8 to 10 cms of femur), a tuft of head hair, finger and torn-nails and some muscles should be preserved in suspected cases of chronic poisoning by heavy metals like arsenic, lead, antimony.
12. In highly putrefied bodies, larvae, maggots, pupa and other entomological samples should be preserved.
13. In embalmed bodies vitreous humour from eyeballs usually remains uncontaminated by the process and may serve the purpose of analysing urea, creatinine and ethyl alcohol.
14. Soil samples from above, beneath and sides of the dead body and control soil samples away from the dead body should be taken in cases of exhumed or skeletonised dead bodies.
15. In case of sexual assault or child abuse, preserve additional samples as required in particular case e.g. swab from bite mark, vaginal wash, breast swab, etc.

Forwarding Samples

All samples should be properly sealed and labelled with the deceased name, post-mortem number, and nature of sample, collection site, preservative used, date and time of collection. Particular attention should be paid to the packaging of samples to avoid loss during transport, and to comply with health and safety regulations. It should be protected by the use of seals around the lids, and accompanied by an intact chain of custody record. It should be handed over to the investigating officer after obtaining proper receipt.

Following Documents should be Enclosed along with the Samples[6,7]:

1. Name, address and phone number of Medical Officer and investigating officer.
2. Circumstances of death and details of drugs thought to be implicated.
3. Past medical history including current or recent prescription medication.
4. Details of emergency hospital treatment and medication given.
5. Copy of forensic pathologist report if available.

Conclusion

Essential information is stored by proper collection, preservation and analysis of samples obtained in a medicolegal case. Because of discrepancies in procedures at various places, most important evidence may be lost. Hence it is important that standardised procedural guidelines should be implemented, so that the results obtained can be meaningfully interpreted all over India. One must have a keen observation and thorough knowledge related to case keeping in mind all possible outcomes in Forensic Services.

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Review Article

Present Status of Postmortem Services Available at Private Medical Institutions in India

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Abstract

There are total 381 medical colleges in India out of which 176 are managed by Government and 205 are managed by private management. Out of these only 138 colleges have post graduation in forensic medicine and among these medical colleges maximum about 63% are managed by government and only 37% by unaided private medical colleges. Only one fourth are having post graduation in forensic medicine. Maximum (75%) of private medical colleges in India are either having no facilities and infrastructure for mortuaries and autopsy or not interested to start such services or not allowed by government. Therefore the maximum students of private medical colleges are not receiving proper training in the area of medicolegal works. There are 28 states and 7 territories in India. Only 13 states and one territory (Pondicherry) where private medical colleges are allowed to run post graduate course in forensic medicine and conduct autopsy. Amongst these states about 40 % of private medical colleges those running post graduate course in forensic medicine and conducting autopsy are in only in Karnataka followed by Andhra Pradesh (11.76%), UP (11.76%), Maharashtra (7.8%). Therefore, it is very essential to Government should make mandatory to all private and government colleges/ institutions to have the facilities for autopsy.

Keywords: Autopsy centre; Medico-legal work facilities; Private medical college.

Introduction

Today, Medical science has a very strong role in disbursement of justice through legal system. However, use of medical knowledge is not new to present age, this law-medicine relationship date back to history, in many parts of the world.

In India, Forensic Medicine has attained current status after passing through various phases. But unfortunately, medico legal investigation system in our country still lags behind developed countries. The broad goal of undergraduate students undergoing teaching in forensic medicine is to produce doctors who are well informed and make observations to draw conclusions, by logical deductions to set enquiries on the right track in criminal matters/medico-legal cases. This requires knowledge of the law in relation to medical practice and medical negligence and respect for medical ethics.[1]

According to recent updates available in MCI websites that there are total 381 medical colleges in India out of which 176 are managed by Government and 205 are managed by private management. Out of these 381, only 138 colleges have post graduation in forensic medicine and among these medical colleges maximum about 63% are managed by government and only 37% are unaided private medical colleges. Although the total number of medical colleges those run by private body are more about 54 % of total but only one

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fourth are having post graduation in forensic medicine [2]. The unaided medical colleges having post graduation in forensic medicine are just 24.87 percent of the total medical colleges managed by private in India.

Forensic Medicine in India

Its Current Status

Forensic medicine has been introduced in the studies of medical graduate students to make them aware of legal and criminal aspects of medicine. A medical graduate needs to know the basic aspects of law in relation to medical practice and the medical side of criminal matters. However as per a study conducted at Bangalore and research institute, the curriculum does not fulfill the very aim of introducing the subject of forensic medicine in the undergraduates.[1]

As it is in India, unlike in developed countries, the major medico-legal work is done by government medical officers few amongst whom are having post-graduate qualification in forensic medicine. Hence it is necessary to train undergraduates in a more integrated manner so that they can execute quality medico-legal work that would be invaluable in the dispensation of justice. Most of the post mortems are done by in Primary health centers, rural hospital and civil hospitals, which are done by government doctors who do not have special degree in forensic medicine. Very few post mortems are done and expert opinions are given by forensic department of medical colleges. The postmortems are done by general duty medical officers who are only having medical graduations with some training in Forensic Medicine.

In rural areas medicolegal autopsies are not done regularly reasons might be variable as due to lack of interest on part of the investigating agency and lack of knowledge or awareness in villagers especially in cases of poisoning. There could even be a cultural taboo or apathy to investigate crimes.

In our country, as it is the infrastructure in health facility is already inadequate. Especially mortuaries are given least importance. Naturally many mortuaries do not have basic facilities. For example, there is lack of electricity supply in rural areas. Hence basic needs like cold storage, facilities cannot be maintained properly. Hence the problem of dead bodies getting decomposed and eventual loss of important medical evidence always looms large. Mortuaries in rural hospitals are not maintained properly and are unclean. The building allotted for autopsies is many a time dilapidated with broken windows and doors which make mortuary a public place. Confidentiality and secrecy can hardly be expected. Proper instruments are not available. Sterility of containers to collect viscera for higher investigation stands the chances of contamination.

The total forensic medicine seats available in India are approximately 325.[2] Out of these about 131 seats for postgraduate courses in forensic medicine is available in private medical colleges/institutions. There are majority of medical graduates do not opt for post graduation in field of forensic medicine and even opt and join the course with a hope that they will get some other clinical or paraclinical subject in forthcoming counseling or entrance. It could be because of the stigma attached to the doctor conducting autopsy that he/she may neither consider as a doctor nor a surgeon. In addition the working condition in the mortuaries is poor and unhygienic. Resulting that the department is under staffed and naturally staffs are over burdened. Autopsies conducted in hospitals which are not medical colleges are usually conducted by doctors who are MBBS or Post graduate of another faculty. They do not have special expertise in forensic medicine. Hence the chances of collecting medical evidence and presenting properly before the court are poor. Since the department of forensic medicine is usually under staffed, there is every chance that mistakes in collecting evidence become inevitable due to over work.

Medical evidence alone stands above all other evidence in a court of law. There are many instances where, even if all witnesses turn hostile, courts have convicted the accused if the medical evidence is conclusive.

Newer techniques like narco-analysis, brain mapping and polygraphy are being utilized by some forensic science laboratories in the investigation of various crimes. However the participation of doctors in such investigations raises many ethical questions.[3]

Postmortem in Private Colleges

Most of the private medical colleges in India are not allowed or eligible for conducting autopsies. Only 25 % of private medical colleges are allowed/eligible to have facilities for postmortem. Maximum (75%) of private medical colleges are either having no facilities and infrastructure for mortuaries or collection of evidence in medico-legal cases or not allowed by government. Therefore the maximum students of private medical colleges are not receiving proper training in the area of medico-legal works.

There are 28 states and 7 territories in India. Only 13 states (Andhra Pradesh, Gujarat, Haryana, Karnataka, Kerala, Madha Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttaranchal) and one territory (Pondicherry) where private medical colleges are allowed to run post graduate course in forensic medicine and conduct autopsy. Amongst these states about 40 % of private medical colleges those running post graduate course in forensic medicine and conducting autopsy are in Karnataka only followed by Andhra Pradesh (11.76%), UP (11.76%), Maharashtra (7.8%).[2] There are 60 % of states including territories in country where either government not allowed to private medical colleges to conduct autopsy and run post graduate course in forensic medicine or private medical colleges are not interested for the same.

Post Mortem Risk Allowance

The post mortem job is a risky, tiresome and often unwanted. In some states like Gujarat, Kerala, Karnataka the doctors performing post-mortem duties are paid extra allowance as an incentive. Whereas, in Punjab the government pays such an allowance only to Para-medical staffs. The state government has also passed a directive to have allowances of Rs. 130 per body to autopsy teams in Maharashtra in 2008.[4]

Current Issue

In twenty one out of thirty five districts of Maharashtra there are no forensic experts.[5] These districts do not have medical colleges or department of forensic medicine and toxicology. Naturally there are no post graduate trainees; these districts do not have any post for forensic consultants. Thus the peripheral post mortem centers are poorly equipped for conducting autopsies.

There are some places in India like Mumbai where a post called "police surgeon" exists. The principle behind this post is that a single person who handles both forensic (collecting evidences, preserving them etc) and therapeutic (treatment, care) levels. It is highly difficult on part of a single person to handle both departments simultaneously that to maintaining good efficiency.

The Positive aspect of current status is that some states such as Karnataka, Utter Pradesh, Andhra Pradesh etc. where a private doctors qualified in forensic medicine from private medical colleges also allowed to conduct medico-legal post-mortems. This has eased the workload of government doctors and also made things easier for the general public.[6]

Remedies

1] The government should allow and if possible make mandatory to the private medical institutions for conduction of medico-legal procedures including autopsies.

2] Such unaided medical colleges should be allowed to run post graduation in forensic medicine and toxicology.

3] The infrastructure of mortuaries in Medical colleges as well as rural hospitals in peripheral areas should be improved.

4] Proper curriculum updates and teaching

facilities should be made available.

5] Post of experts in peripheral centers should be created and filled.

6] Such centers should be well equipped with uninterrupted electric supply to maintain cold storage and other tools to conduct autopsy properly.

7] The police or the legal system and forensic experts are the two arms on which rests the head of medical legal faculty. Hence there should be impartial and clear coordination between the law and medicine.

Thus there is immediate need to look in to matter and take some action in desired direction to bring positive change in current grave situation.

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Case Report

Practice of Illegal Abortion in India: With Reference to a Case Report

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Abstract

Abortion is an important health concern of women but it is increasingly being governed by patriarchal interests which often curb the freedom of women who seek abortion as a right. Consequently, illegal unsafe ways of abortion practices remains as the only alternative for these helpless women; especially the poor, widows and the unmarried. Lack of awareness, ignorance and illiteracy are some of the major factors making rural women unreachable to the safe abortion services. The present case is a hand-pick illustration of the existing status of abortion/MTP service in rural India. How and what are the circumstances compel an average Indian woman to adopt illegal and unhygienic ways of abortion is the prime focus of this case report. A 40 year old married woman becomes pregnant outside marriage; and attends a local quack for abortion. The quack gave her a medicinal twig and some crude herbal abortifacient. She was told to introduce the twig into her vaginal canal and pills to eat. She developed excessive vaginal discharge, lower abdominal cramp, fever and skin rashes. She was diagnosed as a case of septic abortion with co-morbid uterine perforation and Disseminated Intravascular Coagulation (DIC); and subjected to emergency exploratory laparotomy. However, she succumbs to the complications. With this case report, we have tried to put forth a reasonable insight in to the existing inadequacy of abortion laws and apparent failure of Medical Termination of Pregnancy (MTP) services.

Keywords: Illegal abortion; Uterine perforation; Disseminated intravascular coagulation; Septicemia; Herbal abortifacient.

Introduction

As per abortion laws of India, only those doctors who have qualified in Medical Termination of Pregnancy (MTP), approved Government Hospitals (MTP centers), and MTP-license holder clinics can perform MTP.[1] MTP Act was enacted in the year 1971 and came into effect from 1st April 1972; and was subsequently amended in 1975. It has different sections and subsections which define the conditions under which pregnancy can be legally aborted, the beneficiaries, the qualification required to perform MTP and the places where it can be performed.[2] This Act was framed with an intention to reduce the incidence of illegal, unsafe abortion and consequent maternal morbidity and mortality rate. Therefore, this act has been armed with liberalized clauses in order to meet the demands of most needy ones. However, forty years after this ground breaking legislation, majority of women seeking abortion still turn to the uncertified service providers e.g., quacks, mid-wives, medicine shop keepers etc; because of their easy accessibility and door step service facility.[3] Contrary to it, the qualified or government health providers are usually not available in the rural areas; or if available, the

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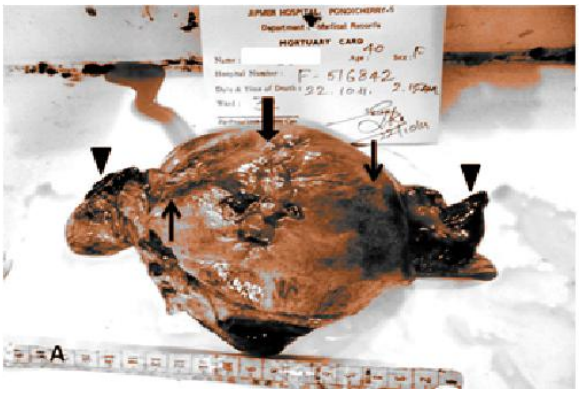
beneficiaries have to face many official and legal intricacies.[4] In most of the occasions the patient confidentiality is breached. Besides, it has been alleged that, the workers at public hospitals and government MTP centers often have disrespectful attitude towards the women seeking MTP service. On many occasions, it has been seen that these centers lack adequate infrastructure to provide immediate, hassle free services. Consequently, the illegal ways of procuring abortion services from the spurious providers remains the only alternative for those helpless women. A study on illegal abortion in rural areas, conducted by the Indian Council of Medical Research (ICMR) revealed that the extent of illegal abortion (13.5 per 1,000 pregnancies) in comparison with legal abortion (6.1 per 1,000 pregnancies) was still quite high and the trend in the past 17 years (1972-1989) could not show a tendency for illegal abortion to decline.[5] In fact, the official report fails to record the unregistered cases of abortion. Because, these estimates mainly depend on the ratio of induced abortions to live births, ill timed and unwanted pregnancies, age specific fertility rates. Others according to some estimates there are 3 illegal abortions for every one legal abortion in rural area and 4-5 illegal abortions for every MTP in urban area. Gupta gave a higher estimate of illegal abortions 8 for every one legal MTP.[6] This highlights the degree of jeopardy of MTP service in India. Hopefully, the present case report may aptly highlight the status of abortion practice in rural India.

Case Report

Body of a 40 year old woman was brought to the mortuary of our hospital with alleged history of death following a gynecological operation. External examination revealed multiple confluent, sub-cutaneous and submucosal hemorrhagic patches all over the body (Fig 1). She had a pale and dehydrated look. A vertical laparotomy stapled wound surrounded by in-situ drainage wounds was found over the anterior abdomen (Fig 1). Examination of perineum revealed dry blood stains with surgical gauge packing in and around the vaginal canal. On removing the gauge pack, foul smelling serosanguinous discharge mixed in clot and gauge piece was oozing out of the vaginal orifice. Exploration of abdomino-pelvic cavity revealed generalised peritonitis. Peritoneal cavity contained about 350 ml of blood tinged transudate. A part of omentum was surgically resected. Stomach contained about 20 ml of mucoid fluid without any specific odour. Multiple, confluent patches of sub-mucosal hemorrhages were found almost all over the gastric mucosa. A dark-

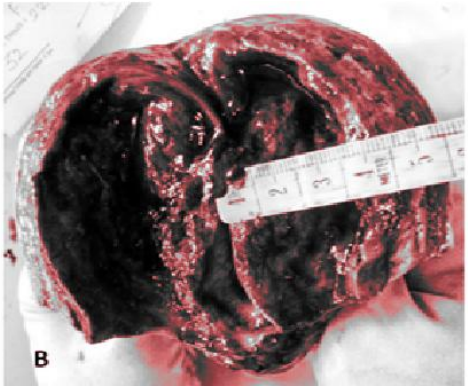
Fig I: (i) Multiple Confluent Patches of Subcutaneous Hemorrhage (Thin Arrows) (ii) Surgically Stapled Wound (15.7cm long) over Anterior Abdomen (Thick Arrow) (iii) Peritoneal Drainage Wound (Spearhead Arrow)

Fig IIA: Posterior View of Uterus & Adenexa. Uterus Bulky (Size-16cmX9.8cmX2cm, wt. 475 gm) (i) Surgical Repair Wound (5cm) of Uterine Perforation on Posterior Wall of Uterine Fundus (Thick Arrow) (ii) Ovaries Enlarged, Congested and Hemorrhagic (Spearhead Arrows) (iv) Multiple Patches of Sub-serosal Hemorrhage (Thin Arrows)



brown submucosal hemorrhagic patch of size 4.5 cm diameter, ulcerated at the center was found over the greater curvature close to the pylorus. A part of mesentery along the distal loops of ileum was surgically removed. The adjacent part of small intestine was hemorrhagic and edematous; multiple petechial hemorrhages were found on both serosal and mucosal surfaces. All major abdomino-pelvic blood vessels were intact. Liver was congested. Cut section revealed multiple patchy areas of hemorrhage. Hemorrhagic changes were noticed in adrenals and in pancreas. Both kidneys were congested. Cut-sections revealed diffuse sub-cortical hemorrhages. Diffuse, mottled sub-capsular hemorrhage was seen over the surface of the spleen. Examination of pelvic viscera revealed enlarged, bulky, dusky brown appearing uterus (Fig 2A). A vertical sutured wound was found on the posterior wall of uterine fundus. Cervix was surgically repaired. Uterine adnexa were congested and had multiple confluent patches of sub-serosal hemorrhage. Both side ovaries were enlarged, hemorrhagic and congested (Fig 2A). Cut-sections revealed stromal hemorrhage and necrosis. On opening the uterine cavity, endometrium was congested, hemorrhagic and necrosed with multiple areas of sloughing (Fig 2B). Heart showed multiple patches of sub-epicardial and sub-endocardial hemorrhages. Both lungs showed multiple sub-pleural hemorrhagic patches and blood tinged edema fluid came out on cut section. Scalp, skull and membranes were intact. Brain was congested and edematous. A subcortical necrosed cavity (2 cm diameter) was found over the lateral surface of the left parietal lobe. On dissection, diffuse sub-cortical micro-hemorrhages were found within the substance of brain.

Fig IIB: Showing Uterine Cavity-Endometrium Congested, Thickened, Hemorrhagic and Necrosed with Areas of Sloughing



Perusal of hospital records revealed, the deceased was admitted in a critical condition with complaints of excessive vaginal bleeding, lower abdominal pain, fever and skin rashes for 1-2 days accompanied with chill and rigor, giddiness. Vitals were, pulse-122/min/ low volume, BP-90/50mm Hg, Respiratory rate-34/min. Investigation reports revealed low hematocrit values (Hb-7gm% improved to 10.8gm%, Hematocrit- 38%). Blood urea level-101 mg/dl, creatinine 2.2 mg/dl, total bilirubin 2.2 mg/dl, total protein 5.3g/dl, and albumin 2.5 g/dl. Arterial Blood Gas analysis showed-pH 6.97, pCO_2 19 mmHg and $pO_2$130 mmHg. Liver enzymes were within normal limits. Emergency explorative abdominal sonography was done and it showed enlarged uterus with thick, irregular endometrial echo-texture, and cavity contained disorganized mass of products of conception (POC). There was perforation of posterior wall of uterine fundus,

laceration of endocervix and edematous bowel loops. The provisional clinical diagnosis was 'Septic abortion with co-morbid uterine-perforation, bowel necrosis, renal failure and DIC'. Therefore, she was shifted for emergency laparotomy after conservative stabilization and blood transfusion. Post operative notes of gynecologist recorded repair of perforation of posterior wall of fundus, and surgical resection of gangrenous cervix and mesentery of distal ileum. She was died on the first post-operative day.

Further history from the attendants and police disclosed the inherent cause of abortion. The deceased was from a remote village of Tamil Nadu. She was married for 21 years and had 2 children. The husband was an alcoholic and used to abuse her physically. Allegedly, she became pregnant out of an illicit affair with a fellow villager and to have abortion surreptitiously, she approached a village quack. The quack gave her some pills of crude herbal extracts to eat, and a twig of some herb to keep inside the vaginal canal. However, in order to achieve rapid abortion, she vigorously manipulated the twig inside her vagina; and the very next day she had abdominal cramp and profuse vaginal bleeding. She was shifted to a nearby primary health center, from where she was referred to our hospital.

Discussion

Illegal abortion is a major cause of maternal morbidity and mortality in India. Singh *et al* observed, about 98% of illegal abortions take place in developing countries like India.[7] Data from 67 studies in 17 countries, indicate that, in some areas, up to 50% of maternal deaths occurring in hospital are due to complications of unsafely induced abortion. In many countries this proportion averages about one-quarter of all maternal deaths in hospital.[8] Nevertheless, the practice of safety-less abortion is not uncommon in developed countries too. Practicing abortion in many catholic European countries is not legal, because of certain religious public sentiments against abortion. A recent incident of death from complicated abortion at Ireland kindled public ire and huge protest to legalise abortion.[9] One in two people in India don't know that abortions are legal. The result: Mortality rate as high as 8% among women who are compulsively approach ill-trained clandestine practitioners for abortions. According some eminent health economist of India 15,000-20,000 women die every year due to lack of access to safe abortion practices.[10]

Safe abortion (MTP) services remains inaccessible to the rural underprivileged parts of India despite such services being provided free by the government. Most of the government and private MTP facilities exist in cities rather than in the underdeveloped rural areas.[11]A wide variety of uncertified and/ or self trained abortion service providers are available in the country side like the informal, alternate system of medicine (ayurvedic, homeopathic, unani etc.) practitioners, Auxillary Nurse Midwives (ANMs), nurses, pharmacists, Traditional Birth Attendants (TBA) and even medicine shopkeepers.[3] In developing countries like India, most of the abortions are performed by local unqualified quacks who use orthodox and unscientific methods like inserting foreign bodies into uterine cavities, oral administration of crude abortifacients, and sometimes inserting poisonous herbal products or substances into the uterus. Therefore, the chances of an induced abortion getting septic is very high in these procedures.[12,13,14] A retrospective study on septic abortion cases revealed that about 58% percent of the complicated abortions were done by self-trained quacks or clandestine service providers; only 9.7% were attended by trained doctors.[15] A study by Singh *et al* (2011), in 62% cases the untrained local quacks were involved in committing the abortion; and midwifery, nurses were involved in 26% of cases, while the patient herself tried in 8% cases. The commonest method employed for inducing abortion was local trauma, i.e. insertion of foreign body into the uterus (70%), followed by ingestion of poisonous substance (14%). Unknown poisonous substances were

introduced into the uterine cavity in 12% of cases.[7] Similar results were recorded by other authors, where 60% of the cases of abortion were dealt by clandestine, unqualified service-providers and, the methods used were oral medications e.g. ayurvedic preparations, chloroquine tablets, high-dose progesterone, high dose estrogen plus progesterone etc, with or without intra-vaginal interventions like use of sticks, roots, iodine-benzoin paste, decoctions of papaya and custard apple seeds etc. Injections (Carboprost or Ayurvedic preparations) used in 36%, and surgical methods (D&C, catheters, intra-amniotic saline or glycerin)were adopted in rest 4% of the cases.[3,4] In the present case the deceased had taken service from a village quack and was treated with a combined method of ayurvedic pills and intra-vaginal insertion of some herb-twig.

Confidentiality and rapid service are two major priorities for most women who seek abortion. Local providers, though uncertified or unqualified are preferred for several reasons. Because, they are familiar and stay close to the community; secondly, they are believed to be trustworthy as regard to the professional secrecy. Nevertheless, most often they lure by waiving-off of their fee amount. The major concern for most women seeking abortion is to get in and out of the clinic as quickly as possible, preferably on the same day, before any neighbour or acquaintance find out the truth. The burden of domestic work and family responsibilities often restrain them to have a longer hospital stay (which may be required for a safe abortion). Therefore, they tend to resort to trusted providers despite their ineligibility. Abortion in adolescents are more likely to be performed by the uncertified, clandestine-service providers and contribute to 20% of all abortion-related deaths among adolescents.[3,11] The reasons Indian women terminate unwanted pregnancies are many and varied; and it may be due to financial burden, pregnancy related health hazards, old age pregnancy, pregnant out of illicit relationship or rape etc. Nevertheless, not so commonly reported reasons for seeking abortion are pregnancy occurring outside marriage or adolescent pregnancies. However, female feticide has taken the front among surreptitious abortions. Not only the untrained/self-trained service providers but also the trained doctors are providing service to this group of women; because, now it is a lucrative gray-business in India. Government sponsored MTP-centers or certified MTP centers have low case loads due to their apathy to maintain confidentiality, may incur high costs due to compulsive bribing practice by the workers in government centers, cringing formalities and pressure to accept sterilization or IUD etc. In many government MTP-centers, especially in rural areas, the services are not available due to lack of doctors, functional equipments and other infra-structures. The MTP training facilities in those areas are also sparingly available. Given such a situation, where safe abortion services are not easily accessible, the problem of abortion is of great magnitude and makes a major contribution to maternal deaths.[16] In the present case, deceased had pregnancy out of extra-marital sexual contact with a fellow villager. Hence, she sought a secret way of procuring abortion from a known village quack, so that she can get an immediate, hassle free and confidential service at door step. The disadvantages with the unqualified service providers are, their inability to attend the complications of abortion or ancillary medical needs and failure to do a timely referral etc. Hence, illegal ways of abortion practices are prone to land up in to complications e.g. shock, uterine perforation, cervical laceration, bowel injuries, peritonitis, septicemia, septic shock, acute renal failure and DIC etc. However, commonly encountered complications include incomplete abortion, haemorrhage and uterine or cervical injury.[17] Study by Agrawal *et al* (2008), it revealed that about 63% cases of complicated abortion brought to the hospital are subjected to emergency explorative laporatomy. Out of those uterine perforation were seen in 40% of cases, bowel injury in 34% of cases, blood/pus or faecal peritonitis in 18% cases, and death in 8% cases.[18] The major killers among the complicated abortion, in descending order are hemorrhagic shock,

septicemia (together accounts 58%), disseminated intravascular coagulation (28%), acute renal failure (9%) and adult respiratory distress syndrome (5%).[19,20] In present case, the deceased had suffered from uterine perforation, cervical laceration and multiple bowel injuries. She was died of complications of incomplete abortion *i.e.* refractory shock, disseminated intravascular coagulation and acute renal failure.

Conclusion

This case report legibly projects a clear picture of the prevailing abortion practice in India. Therefore, it requires a considerable attention in order to transform the theoretical right to a practically feasible safe abortion practice into service. The current situation warrant reforms in the trend of abortion practice; and need to initiate a campaign to raise public awareness with a special attention to the unreachable, rural sectors. Appropriate redistribution of resources in critical sectors, and reduction of the extraneous paperwork that discourages proper reporting by the service providers should be considered. Legal stakeholders should contemplate for reforms in existing MTP Act in order to educate and trained the uncertified or unqualified abortion service-providers; so that the clandestine practice of unsafe abortion may be prevented and simultaneously, they can be mobilized as a resource at unreachable rural areas.

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Short Communication

Implementation of E-learning Technologies in the Classroom and the Assessment of the Medical Students' Attitude towards E-learning: A Pilot Study

Arun Kumar Agnihotri*, Smriti Agnihotri**

Abstract

The implementation of E-learning technologies in the classroom enhances the learning process, does not replace the lecturer or tutor. The challenges for implementation of E-learning technologies are extensive for the lecturers and the students as well. This paper discusses the issues related to the infrastructure aspects, pedagogic consideration and the need for the technology, and records the students' attitude towards implementation of E-learning in the traditional way of teaching. The study was conducted in the Department of Forensic Medicine at SSR Medical College in the year 2011. The students were asked to fill out a questionnaire online that covered a wide range of relevant attitudes and prior experience of information technology. Majority of students possess sufficient computer skills and agree that E-learning technologies could play an important role in medical teaching. To conclude, medical students could be benefited from the implementation of E-learning technologies in the traditional ways of teaching. Special measures should be taken to the students who lack computer skills.

Keywords: E-learning,Infrastructure,Implementation.

Introduction

Technology path enhances the learning process, but does not replace the lecturers/ tutors. Due to recent development of information technologies, the convention education system has crossed the boundaries to reach the unreached people through a virtual education system. In this system *i.e.* distance methods of delivery; the students get the opportunity for education through self-learning with use of technology-mediated techniques. The benefits of utilizing technology, particularly for developing online collaborative activities are well documented[1], but the many implications of implementing an E-learning program require careful consideration.

Implications and Challenges

The students and the staff both are greatly affected by the implementation of E-learning.

Issues Related to Students

1. *Adapting to a change in learning processes:* The students are greatly affected because of the shift in learning styles. Knight proposed that E-learning will be beneficial to students who are used to be 'spoon fed' because the students can no longer be passive in this type of learning.[2] Kershaw point out that the success depends on level of interaction between students and lecturers.[3] Cooper extended this fact that the students who are lacking in the skills to study independently will not react well in a virtual environment.[4] *Under such circumstances, institutions must be aware that students will react differently to the changing paradigm of learning.*

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2. *Dealing with Isolation Issue:* According Cooper, "*electronic contact cannot sustain the quality and multi-dimensional kind of tutor-student relationship which seems to be required for real learning*".[4] Michailidou *et al* claims that the development of virtual education motivates students to participate in learning by exploring and playing with lesson material.[5] It can provide an active, independent, student centered and tutor facilitated engagement which enables communication with other students and teacher which may not be always within the traditional classroom setting.
3. *Identification of Critical Success Factors:* The critical success factors in an E-learning environment are different from a traditional classroom setting. Volery *et al* remarks that students who have prior experience of using information technology will be more successful in a virtual classroom that those who do not have it. They have also reported that the technological factors such as malfunctioning hardware, software configuration, slow servers, busy signals and lack of are the barriers for the success of learning.[6] *This challenge is best met by ensuring the proper functioning of the technological infrastructure before E-learning is implemented.*
4. *The Importance of Quality Assurance:* Quality assurance is an important key in the implementation of E-learning because the students believe that the online degree is not as credible as the traditional qualification. Caudron suggests that online students have to be more disciplined and work harder to achieve their goals.[7]

Issues Related to Staff

1. *Incorporation of new teaching style: For lecturers, the major challenge is a change in teaching style*. The institutes are demanding a change in the role of university lecturers. According to McFadzean, traditional teaching and learning skills need to be changed in order to get maximum benefit from virtual learning.[8] The study carried out by Learning Peaks implies that in virtual environment the role of a lecturer focouses more on administration that teaching.[9]
2. *Accommodation of Changes in Workload:* As far as workload is concerned, there are mixed findings. Moore presented contradictory findings in his two studies. First reported that distance lecturers experienced a reduced workload, whilst second study showed that lecturers needed about twice as much time to teach an online course compared with traditional course.[10]

This study has been planned to analyze the issues related to students and to assess medical students' attitude towards the implementation of E-learning in the classroom.

Methodology

Setup of Online Classroom

An online classroom was setup for third-year medical students with the evidence of showing social presence in the classroom, giving an overview of the material, providing learning material and resources for the selected unit of work, and giving them to complete automated and authentic assessment activities based on the unit of work.

Subjects and Questionnaire Design

Twenty students (20) were selected randomly from a class of 36 students to assess the online classroom in the cyber library of SSR Medical College and complete the assignments. They were asked to express their views for the implementation of E-learing technologies in the traditional way of teaching on the basis of questionnaire distributed to them by email. The data were collected from an online survey. The participation was

Table 1: Students' Response to Question – 1 (What do you Think about the Following Statements? How Far do you Agree or Disagree?)

	Strongly agree	Agree	Disagree	Strongly disagree	Response count
E-learning technologies should play a more important role.	41.2% (7)	**52.9% (9)**	5.9% (1)	0.0% (0)	17
E-learning programs are able to replace lectures.	17.6% (3)	35.3% (6)	**41.2% (7)**	5.9% (1)	17
In medical teaching, there is no need for the use of e-learning programs.	11.8% (2)	11.8% (2)	**47.1% (8)**	29.4% (5)	17
E-learning training should be made available to supplement lectures and exercises.	**58.8% (10)**	35.3% (6)	5.9% (1)	0.0% (0)	17
E-learning should be nothing more than the distribution of notes over the internet.	0.0% (0)	11.8% (2)	**52.9% (9)**	35.3% (6)	17
I find it awkward to speak out in the classroom, but I would find it easier to participate in a discussion in an online-forum.	**64.7% (11)**	23.5% (4)	5.9% (1)	5.9% (1)	17

voluntary and anonymous. The lecturer was not able to determine who has or has not filled out the questionnaire. The questionnaire was designed by Survey Monkey and the web link *i.e.* http://www.surveymonkey.com/s/NGLKBVN was sent to participants by email. Out of 20 students, only 17 students responded. The questionnaire covers items mainly about:

1. *Attitudes towards E-learning* and
2. *Computer and Internet usage*.

Attitudes towards E-learning were determined by the students' agreement or disagreement with several statements about the importance of information and technology in medical education. Computer usages and attitudes towards E-learning were measured by using an ordinary scale.

Results

Table 1 shows students' agreement or disagreement with statements on usefulness of E-learing. Majority of students (16 out of 17) considered that E-learning technologies should play an important role in teaching and its training should be available to supplement the lectures and exercises. About 88% students found themselves awkward to speak out in the classroom, but easier to participate in a discussion over online forum. On other hand, about 50% students disagreed with the statement that E-learning programs are able to replace lectures.

Table 2 and 3 show number (%) of students having experiences with some learning

Table 2: Students' Response to Question – 2 (Different Types of Learning Programs Exist on Internet. With which of the Followings have You Already Worked?)

	Response Percent	Response count
Image repositories	52.9%	9
Hypertexts (web-based textbooks)	58.8%	10
Simulations (Patient or laboratory simulations)	23.5%	4
Quizzes	**82.4%**	**14**
crosswords	23.5%	4
Cross matching	29.4%	5
Animations	58.8%	10
Encyclopedias	**82.4%**	**14**
Forums for communicating with other students	35.3%	6
Learning management systems	0.0%	0
Other (please specify)	11.8%	2

Table 3: Students' Response to Question – 3 (Which of the Following Types do you Consider the Most Useful for Learning?)

	Response Percent	Response count
Image repositories	58.8%	10
Hypertexts (web-based textbooks)	41.2%	7
Simulations (Patient or laboratory simulations)	**76.5%**	**13**
Quizzes	47.1%	8
crosswords	11.8%	2
Cross matching	11.8%	2
Animations	58.8%	10
Encyclopedias	**76.5%**	**13**
Forums for communicating with other students	41.2%	7
Learning management systems	5.9%	1
Other (please specify)	0.0%	0

Table 4: Students' Response to Question – 5 (How Often do You Use a Computer for the Following Tasks?)

	Daily	Several times a week	Several times a month	Less often	Never	Response count
Write texts	**29.4% (5)**	**29.4% (5)**	11.8% (2)	23.5% (4)	5.9% (1)	17
Create spread sheets or perform calculations	0.0% (0)	0.0% (0)	6.3% (1)	**68.8% (11)**	25.0% (4)	16
Create or touch up images	0.0% (0)	23.5% (4)	**29.4% (5)**	**29.4% (5)**	17.6% (3)	17
Play games	17.6% (3)	**29.4% (5)**	23.5% (4)	17.6% (3)	11.8% (2)	17
Send emails	23.5% (4)	**47.1% (8)**	17.6% (3)	11.8% (2)	0.0% (0)	17
Chat	**47.1% (8)**	23.5% (4)	23.5% (4)	5.9% (1)	0.0% (0)	17
Participated in online discussion forums	5.9% (1)	11.8% (2)	5.9% (1)	29.4% (5)	**47.1% (8)**	17
Search the internet for information	41.2% (7)	**52.9% (9)**	5.9% (1)	0.0% (0)	0.0% (0)	17
Create a website or publish something on the internet	5.9% (1)	5.9% (1)	5.9% (1)	23.5% (4)	**58.8% (10)**	17

Table 5: Students' Response to Question – 6 (Do You have Ready Access to a Computer Which can be Used for Learning?)

	Response Percent	Response count
Yes, my own computer	**82.4%**	**14**
Yes, a computer shared by a family	17.6%	3
Yes, in a public computer facility	0.0%	0
No	0.0%	0

Table 6: Students' Response to Question – 7 (Does this Computer have Internet Access?)

	Response Percent	Response count
Yes, modem (telephone line)	23.5%	4
Yes, ISDN or similar	0.0%	0
Yes, ADSL or another type of broad-band	**64.7%**	**11**
Yes, LAN (public computer rooms at the institute)	0.0%	0
No	11.8%	2
Not applicable (because no computer)	0.0%	0

programs and their usefulness. The students found some programs such as simulations (76.5%) and encyclopedias (76.5%) as most useful for learning (Table 3).

Table 4 shows frequency of computer usage. Majority of students had prior experience of computer usage. The students use computer mainly to search internet for information and chat (100%), less often to participate in online discussion forums (23.5%), and never create a

Table 7: Students' Response to Question – 8 (How Often do You Use a Computer for Learning?)

	At least weekly	At least monthly	Once a term	Less often	Never	Response count
To search the internet for relevant WebPages.	64.7% (11)	23.5% (4)	5.9% (1)	5.9% (1)	0.0% (0)	17
To download notes or similar items.	35.3% (6)	29.4% (5)	17.6% (3)	17.6% (3)	0.0% (0)	16
To use a learning management system for a course.	5.9% (1)	0.0% (0)	5.9% (1)	41.2% (7)	47.1% (8)	17
To use computer or web-based learning programs (CD-ROMS, Webpages, etc.)	41.2% (7)	17.6% (3)	5.9% (1)	29.4% (5)	5.9% (1)	17

website or publish something on the internet.

Table 5 shows computer infrastructure available to students. All most all students had access to a privately owned computer either by own computer (82.4%) or shared with family members (17.6%).

Table 6 shows type of internet access to students. The great majority students had access to the internet including 64.7% *via* ADSL and 23.5% *via* modem.

Table 7 shows frequency of computer use for learning. The students often use computer for learning to search the internet for relevant pages (64.7%), web-based learning programs (41.2%) and download notes and similar items (35.3%).

In response to 'question number 4' *i.e.* at which age did you use a computer for the first time (PC, Mac or something similar)? - The average age when students began using computers for the first time was 11.5 years (9-14 years).

Discussion

The rapid development of computer and information technology in recent years has resulted in the implementation of E-learing technologies to enhance and complement traditional classroom teaching in many fields including medical science. E-learning technologies such as Learning Activity Management System (LAMS) and wiki provide more efficient and hassle-free alternatives for the preparation of teaching materials, evaluation of students' performance and management of classroom data and statistics.[11,12] Due to its emphasis on independent self-directed learning, E-learning is particularly suited for problem-based learning (PBL). PBL which is first introduced in McMaster University Medical School in 1969, is an innovative collaborative teaching and learning instructional strategy in which students solve the problems under the guidance of facilators.[13,14] This type of learning process is known to promote active participation and self-directed learning and transforms the teacher-directed learning experience to student-centered learning.

The findings of the present study suggest that a fairly large number of students have internet connections by dial-up connection. This mode of internet connection is slow and hinders the use of synchronous communication tools that require one to stay online for a long period. Preference should be given to asynchronous communication tools like forums in which teachers and students do not have to be online at the same time. This study also shows that most of our students are passive internet user and only a small number of students have experience with online discussion forum. The lack of experience with synchronous and asynchronous online communications may cause problems when using the collaboration tools included in Learning Activity Management System.[15]

Attitudes towards E-learning Technologies

Most students agree that E-learning technologies should play an important role in teaching and could serve as a supplement for the lectures and exercises. However, many students disagree that E-learning programs

could replace traditional ways of teaching. In contrast, Dørup reported a slightly greater proportion of medical students in favor of replacing traditional lectures with eLearning.[16]

Limitation of Study

This is a pilot study with a small sample size. Further researches are required on a large population to identify gender differences and to analyze the relationship between the computer use and the attitude towards E-learning. Researches show that the intensity of computer uses and previous experience with CBT/WBT have the greatest effect on students' attitude towards E-learning.[17]

Conclusion

The critical factors for the success of implementation of eLearning programs are *prior experience of using information technology, the technological infrastructure* and *the facilitator*. E-learning must be appropriate to students' level of computer expertise in order to avoid a source of frustration. Computer courses to students before implementation of E-learning technologies in classroom can improve this situation by influencing students' capabilities.

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Abstract Page

The second page should carry the full title of the manuscript and an abstract (of no more than 150 words for case reports, brief reports and 250 words for original articles). The abstract should be structured and state the Context (Background), Aims, Settings and Design, Methods and Material, Statistical analysis used, Results and Conclusions. Below the abstract should provide 3 to 10 keywords.

Introduction

State the background of the study and purpose of thestudy and summarize the rationale for the study or observation.

Methods

The methods section should include only information that was available at the time the plan or protocol for the study was written such as study approach, design, type of sample, sample size, sampling technique, setting of the study, description of data collection tools and methods; all information obtained during the conduct of the study belongs in the Results section.

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Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations. Extra or supplementary materials and technical details can be placed in an appendix where it will be accessible but will not interrupt the flow of the text; alternatively, it can be published only in the electronic version of the journal.

Discussion

Include summary of key findings (primary outcome measures, secondary outcome measures, results as they relate to a prior hypothesis); Strengths and limitations of the study (study question, study design, data collection, analysis and interpretation); Interpretation and implications in the context of the totality of evidence (is there a systematic review to refer to, if not, could one be reasonably done here and now?, what this study adds to the available evidence, effects on patient care and health policy, possible mechanisms); Controversies raised by this study; and Future research directions (for this particular research collaboration, underlying mechanisms, clinical research). Do not repeat in detail data or other material given in the Introduction or the Results section.

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Standard journal article

[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. J Oral Pathol Med 2006;35:540-7.

[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, et al. Caries-preventive effect of fluoride toothpaste: A systematic review. Acta Odontol Scand 2003;61:347-55.

Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone iodine antisepsis. State of the art. Dermatology 1997;195 Suppl 2:3-9.

Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. J Periodontol 2000;71:1792-801.

Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. Dent Mater 2006.

Personal author(s)

[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

[7] Nauntofte B, Tenovuo J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O, Kidd EAM, editors. Dental caries: The disease and its clinical management. Oxford: Blackwell Munksgaard; 2003. p. 7-27.

No author given

[8] World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

Reference from electronic media

[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. www.statistics.gov.uk/downloads/theme_health/HSQ 20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

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