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Original Article

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Profile of Medico-Legal Cases at a Tertiary Care Hospital in Ahmednagar, Maharashtra

Kadu Sandeep S.*, Tandle Ranjit M., Deshpande V.L.*, Waje Dilip R.***

Abstract

Background: Casualty Medical Officer has to give emergency treatment first and stabilize the patient. He also has to carry out thorough documentation of different medico-legal cases. Dr. Vikhe Patil Memorial Hospital is a tertiary care center, situated in rural area near Ahmednagar, Maharashtra. *Objectives:* 1. To study profile of different clinico-medico-legal cases at tertiary care center. 2. To analyze the data for better patient care. *Study Design:* Present study is record based retrospective study conducted at Casualty of Dr. Vikhe Patil Memorial Hospital attached to Padmashree Dr Vithalrao Vikhe Patil Foundation's Medical College, Ahmednagar from 1st January 2015 to 30th November 2015. *Results:* Present study reveals 224 medico-legal cases. Out of total cases, road traffic accidents constitutes majority of cases (138, 61.60%), followed by poisoning(30, 13.40%), burns(22, 9.80%), physical violence (14, 6.25%), fall from height(10, 4.5%), sexual offenses and trauma by animal(4, 1.7% each) and snake bite (2, 0.9%). Present study reveals male domination (152, 67.85%). Most of the cases occurred between age group of 21-30 years (66, 29.40%), followed by 31-40 years (44, 19.40%). Maximum number of the cases was from rural area (170, 75.90%). The study also reveals maximum number of cases occurred in May (30, 13.40%), followed by April and October (28, 12.50% each).

Keywords: Medico-Legal Cases; Tertiary Care Center; RTA; Casualty.

Introduction

A medico-legal case is one where besides the medical treatment; investigations by law enforcing agencies are essential to fix the responsibility regarding the present state/condition of the patient. The case therefore has both medical and legal implications [1]. These cases are an integral part of medical practice that is frequently encountered by Medical Officers working in Casualty.

Medico-legal cases are those related to crime against human body like alleged cases of assault, road traffic accidents, burns, poisoning, snake bite, insect bite, industrial accidents, alcoholic intoxications etc. and others like insurance and sickness-fitness cases. Study and analysis of medico legal cases is an inherent aspect for the obviation of preventable causalities in future and to study the rate of crime in that area [2].

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Material and Methods

This is a record based retrospective study of medico-legal cases registered in medico-legal register in casualty of Dr. Vikhe Patil Memorial Hospital which is a tertiary care center attached to Padmashree Dr Vithalrao Vikhe Patil Foundation's Medical College, situated in rural area near Ahmednagar, from 1st January 2015 to November 2015. Related general data like type of medico-legal cases reported in casualty during this period, age and sex of cases, months and season concern in arrival of medico-legal cases in casualty were collected from medico-legal register. During this study period the total 224 medico-legal cases were registered in casualty of Dr. Vikhe Patil Memorial Hospital. The collected data was analyzed with Microsoft excel and presented in

tables, graphs and pie charts by using various parameters and compared with other studies.

Observations and Results

Table 1: Age wise distribution of medico-legal cases

Age in Years	No of cases	Percentage
0-10	4	1.7
11-20	36	16.0
21-30	**66**	**29.4**
31-40	44	19.4
41-50	26	11.6
51-60	26	11.6
Above 60	22	9.8

Table 1 shows maximum cases were between age group 21-30 years, followed by 31-40.

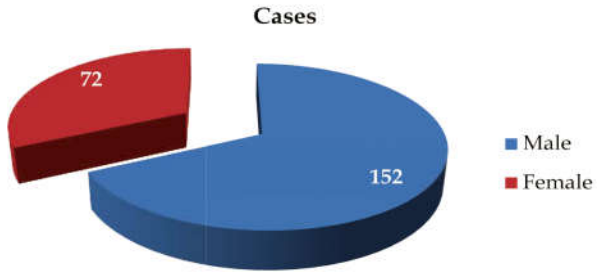

Chart 1: Sex wise distribution of medico-legal cases
Chart 1 shows male dominance.

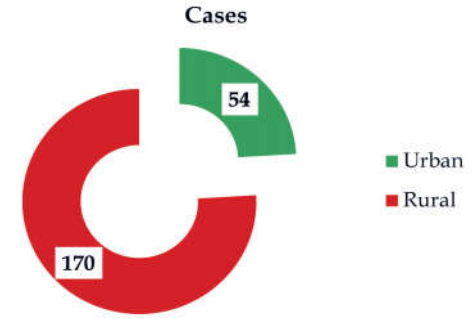

Chart 2: Area wise distributions of medico-legal cases
Chart 2 shows that most of the cases were from rural area.

Table 2: Profile of medico-legal cases

Profile	Cases	Percentage
Road Traffic Accidents	138	61.60
Poisoning	30	13.40
Burns	22	9.80
Physical violence	14	6.20
Fall from height	10	4.50
Sexual offences	4	1.78
Bullock horn injury	4	1.78
Snake bite	2	0.89

Table 2 reveals that maximum cases reported were of Road traffic accident, followed by poisoning.

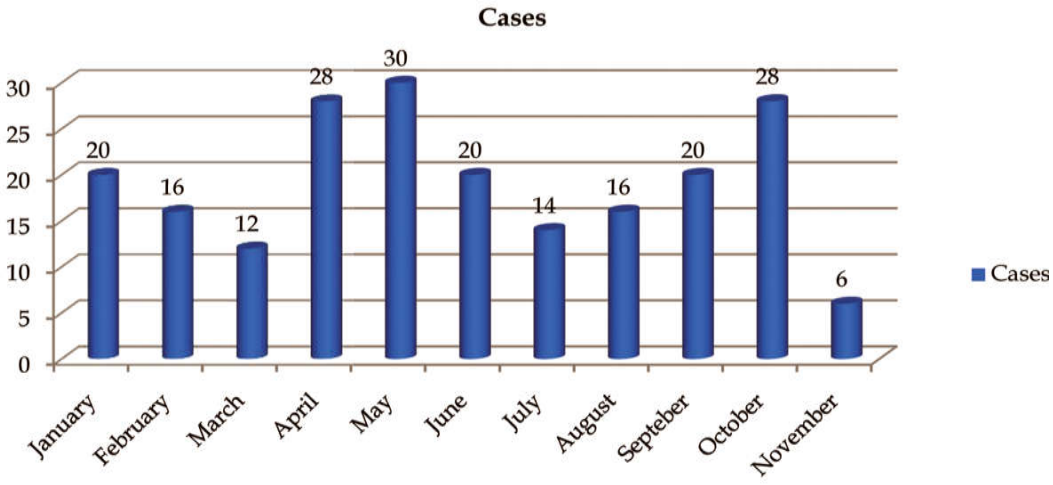

Chart 3: Month wise distribution of medico-legal cases
Chart 3 shows that most of the cases were reported in May, followed by April and October

Table 3: Season wise distribution of medico-legal cases

Season	Cases	Percentage
Summer	86	38.39
Winter	68	30.35
Rainy	70	31.25

Table 3 revealed that majority of cases was reported in summer

Discussion

Our study revealed total 224 medico-legal cases from Casualty of Dr. Vikhe Patil Memorial Hospital attached to Padmashree Dr Vithalrao Vikhe Patil Foundation's Medical College, Ahmednagar from 1st January 2015 to 30th November 2015.

Present study showed that most of the cases were between age group 21-30 years (29.40%) followed by age group 31-40 (19.40%). The findings are similar with other study [3-6]. Most of the cases were between 21-40 age groups, as this age group was more active, bread earner so involved more in outdoor activities.

Our study revealed that most of the cases were of male (67.80%). This is similar with the various studies

by other authors [3-6]. As our study was carried out in rural area, males were involved in farming and related outdoor activities and females are mostly involved in household activities as per rural customs. Therefore males were more vulnerable and exposed to situations falling as MLCs in our study.

This study showed rural dominance which is in consistence with study by Abhishek Yadav et al [7].

In present study, we found that most of the cases were of RTA (61.60%) followed by poisoning (13.40%) and physical violence (6.25%). This was consistence with other studies [3-5]. As rural infrastructure like roads, electrification, transport were not developed, rural population was more prone to road traffic accidents. As rural people have easy accessibility to poisons and they are more exposed to agriculture poisons, poisoning is second most common in this study. Poverty, illiteracy, property disputes and dowry custom were major issues leading to burns (9.8%) and physical violence (6.25%) in present study [7].

Our study maximum numbers of cases were noted in to the month of May, followed by April and October. These were the months when farmers were involved in more agricultural activities. In present study, maximum cases occurred in the summer which is consistent with study by Gautam Biswas et al [8], as this is a season of vacations and marriage, probably leading to increase frequency of travel by road. The other reason is that probably because this season makes people tired, irritable and rash, leading to rise in accidents.

Conclusion

The casualty department is a backbone of any hospital where different emergencies as well as medico-legal cases are handled. Our study showed maximum number of medico-legal cases were due to RTA, followed by assault, poisoning. In most of the hospitals, CMOs are MBBS only. These can be prevented by proper education, awareness and training of casualty medical officers. They must be trained by Forensic Experts in relation to their medico-legal duties. From our study, importance of tertiary care centre in rural areas is evident.

Conflict of Interest

Nil.

References

1. BARC Medical guidelines for patient care, 2nd edition-January 2009; page no 12.
2. Malik Yogendra, Rahul Chawla, Gaurav Sharma, Pushpendra Malik, Rajendra Singh, Achal Tripathi. Profile of medico legal cases in causality of a rural medical college of Hariyana. *Journal of Indian Academy of Forensic Medicine.* 2013; 35(4): 367-8.
3. Garg Vishal, Verma SK. Profile of medico legal cases at Adesh institute of medical sciences and research, Bhatinda, Punjab. *Journal of Indian academy of forensic medicine.* 2010; 32(2): 150-2.
4. Sahdev P, Lacqua MJ, Singh B, Dogra TD. Road Traffic Fatalities in Delhi: Causes, Injury Patternand Incidence of Preventable Deaths. *Accid Ann Prev.* 1994; 26: 377-84.
5. Harish KN, Srinivasa RP. Analysis of Medico-Legal Cases at Harsha Hospital Nelamangala, Bangalore Rural. *Indian Journal of Forensic Medicine & Toxicology.* 2013; 7(1):254-87.
6. Sharma BR, Harish D, Sharma V, Vij K. Road Traffic Accidents – a Demographic and Topographic analysis. *Med Sci Law.* 2001; 41:266-74.
7. Abhishek Yadav, N K Singh- Pattern of medico-legal cases in rural area of Faridabad, Haryana. JIAFM. Jan-March 2013; 35(1): 60-62.
8. Gautam Biswas, S K Verma, N K Agrawal, et al-Pattern of road traffic accidents in north east Delhi. Journal of Forensic Medicine and Toxicology. Jan-Jun 2003; 20(1).

Original Article

Indian Journal of Forensic Medicine and Pathology
Volume 8 Number 4, October - December 2015

Estimation of Haemoglobin in Postmortem Period: A Preliminary Study

Rajesh Bardale*, Vaibhav Sonar, Shrikant Shinge*****

Abstract

Anaemia is prevalent in Indian women. Moreover, presence of anaemia is a leading cause of maternal death. The aim of the present study is to evaluate haemoglobin level in postmortem period and assess its utility in anaemic deaths. The material comprised of 10 cadavers with known time of death. All these cases have haemoglobin estimated prior to death. Estimated haemoglobin more than 24 hours prior to death was excluded from the study. These cadavers consist of 10 female with age varied from 20 years to 46 years (mean age 30.3 years). Estimation of haemoglobin in conjugation with blood smear study may give fair idea regarding the status of anaemia in maternal deaths.Up to 3 hours postmortem interval all samples show decrease in haemoglobin content.

Keywords: Death; Anaemia; Haemoglobin; Forensic; Blood.

Introduction

Anaemia is prevalent in Indian women [1]. Moreover, presence of anaemia is a leading cause of maternal death [2]. In hospitalized patients it is relative easy to estimate haemoglobin or other parameters and treat the patient accordingly. If patient dies in spite of treatment then it is easy for clinician to certify such deaths. Many times such patients with history of anaemia are brought in emergency department and they are declared dead on arrival or treated for brief period. Such patients are referred for forensic postmortem examination. During autopsy gross examination of organs and microscopic examination of tissues are studied and accordingly cause of death is provided. But in this entire exercise, anaemia though present, receives seldom attention. Perusal of literature reveals that few studies were conducted to estimate haemoglobin in postmortem period [3]. Considering this the aim of the present study is to evaluate haemoglobin level in postmortem period and assess its utility in anaemic deaths.

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Material and Methods

The material comprised of 10 cadavers with known time of death. All these cases have haemoglobin estimated prior to death. Estimated haemoglobin more than 24 hours prior to death was excluded from the study. These cadavers consist of 10 female with age varied from 20 years to 46 years (mean age 30.3 years). Total 70 samples were analysed. In each case 10 ml blood was collected without adding any preservative in polycarbonate tubes. All samples were maintained at room temperature. Sequential analysis of blood for estimation of haemoglobin was done at interval of 3 hour, 6 hour, 12 hour, 24 hour, 36 hour, 48 hour and 60 hour in postmortem period. The haemoglobin content was determined by the visual method described by Sahli and test done by using Sahli'shemoglobinometer (Fig 1).

Results

The antemortem value and postmortem value of haemoglobin in different postmortem interval (PMI)

is shown in table 1. Up to 3 hours PMI all samples show decrease in haemoglobin content (Fig 2). At the end of 6 hours PMI, 90% of samples show increase in haemoglobin content than the 3 hour PMI content and only 10% sample show decrease in haemoglobin content. From 12 hours PMI, the haemoglobin content show different values. About 30% of samples show increase in haemoglobin content than the 6 hour PMI whereas 70% samples show decrease in haemoglobin content over the same PMI. After 24 hours PMI the values become erratic with varying results. After 36 hours PMI decomposing smell begins to appear and after 60 hours PMI the blood becomes unsuitable for the test.

Table 1: Showing antemortem and postmortem haemoglobin value in (%)

Case number	Antemortem haemoglobin (%)	Postmortem haemoglobin (%) in hours						
		3	6	12	24	36	48	60*
1	11.3	7.5	8.5	7.5	7.8	8	9	8.5
2	8.3	7.5	12.5	10	11	9	8.5	11
3	12.5	8.5	12	8	11	12.5	9.5	6
4	10	6.4	9	10.5	11.5	12.5	8	5.5
5	12	9.5	11	13	14.5	13.5	11	9
6	12.5	8.5	5.5	8	9	11	9.5	8
7	13.2	11.5	12.6	8.5	13	10.5	10.1	6.8
8	13	10.8	11.2	7.5	9.2	10.5	9.5	10.5
9	10.5	9.2	10.5	13	15.2	11.5	9.5	11
10	11.5	8.8	11.2	9.2	10.5	13.2	12.6	9.5

* Blood not suitable for estimation

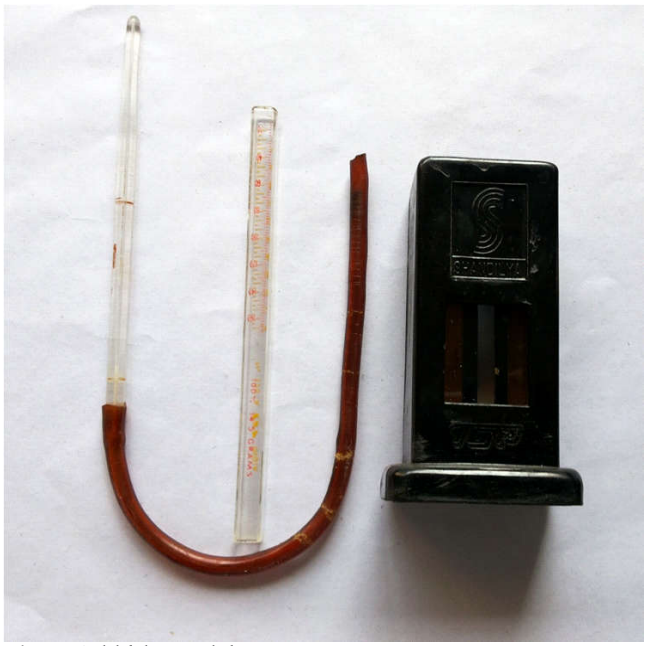

Fig. 1: Sahli'shemoglobinometer

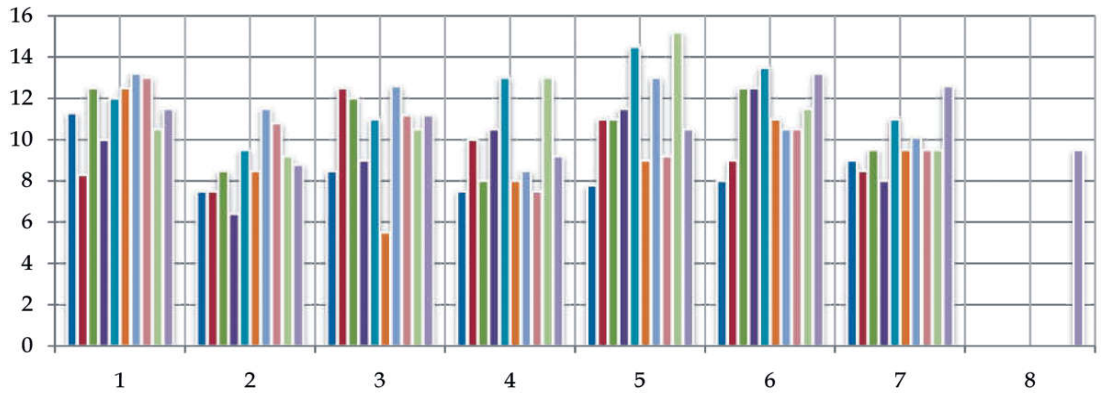

Fig. 2: Postmortem value of haemoglobin in postmortem period in different hours

Discussion

Utility of measuring haemoglobin in postmortem period assumes greater importance in cases which are declared dead on arrival and involves medicolegal formalities especially in maternal deaths with anaemia. Estimation of haemoglobin in conjugation with blood smear study may give fair idea regarding the status of anaemia in maternal deaths. The present study was conducted to measure the haemoglobin in postmortem period and to compare with the antemortem value. But the results are disappointing and erratic. For the first three hours PMI there is fall in haemoglobin content but after this period no reliable measurements could be obtained. When compared the present study with study of Laiho et al (1981), which was conducted in Finland, the researchers had noted the haemoglobin content remained quite steady up to PMI of 168 hours and thereafter started decreasing [3]. The mean haemoglobin content in 0 to 12 hour PMI was about 10 gm% while in the PMI of 120 to 168 hours the mean value was 10.5 gm%. They had studied 123 human cadavers stored in a mortuary cold room at about 4^{O}C. The results of present study are not in agreement with the cited study. The difference in the results could be attributed to temperature difference. The present study was conducted in summer months where mean environmental temperature was about 32.3^{o}C. Similarly we had not used any preservative to preserve the blood and the blood samples were kept at room temperature. Considering our environmental conditions, the blood gets rapidly decomposed and therefore result obtained at Finland cannot be reproduced in India. The other aspect is that Laiho et al (1981) had used cyanmethaemoglobin method to determine haemoglobin content whereas in the present study we had employed method described by Sahli [3].

The major Limitations of present study were (1) small sample size; (2) evaluation of samples in uniform environmental conditions i.e. in an ambient environmental temperature of 32.3^{0} C and (3) the study had not considered the clinical interventions like fluid or volume overload, or blood transfusions. Though the results of present study are not encouraging beyond three hours PMI, but one can attempt further study with large sample size with contemporary laboratory method to estimate haemoglobin content.

Conclusion

Estimation of haemoglobin in early PMI of 3 hours is reliable one and there is fall in the haemoglobin content as compared with antemortem value.After 3 hour PMI the results obtained are erratic and non-reliable and therefore caution to be exercised while interpreting the results.

References

1. Kalaivani K. Prevalence & consequences of anaemia in pregnancy. Indian J Med Res. 2009; 130: 627-33.
2. Ezzati M, Lopus AD, Dogers A, Vander HS, Murray C.Selected major risk factors and global and regional burden ofdisease. Lancet. 2002; 360: 1347-60.
3. Laiho K, Penttila A. Autolytic changes in blood cells and other tissue cells of human cadavers. I. Viability and ion studies. Forensic SciInt. 1981; 17: 109-20.

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Original Article

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Hematological and Biochemical Toxic Effect of Commonly Used Organophosphate Pesticide Malathion in Teleost Fish Clarias Batrachus

Mishra B.P.*, Rai Pramod Kumar, M.P.S. Marwaha***, Bhupinder Kaur Anand****, Lingidi Jhansi Lakshmi*****

Abstract

Objective: To study the hematological parameter - hemoglobin, total leucocyte count and biochemical parameter - serum cholesterol, serum glutamate pyruvate transaminase in fish Clarias Batrachus exposed under different concentrations of Malathion pesticide. *Methodology:* This experimental research study has been done in teleost fish Clarias Batrachus, exposed 24 to 96 hours, to four different concentrations of Malathion pesticide. Estimation of serum cholesterol and SGPT had been done as biochemical parameter and Hemoglobin as well as T.L.C had been analyzed as hematological parameter. *Results:* There were no significant changes in hemoglobin level at lower concentration of Malathion pesticide within short intervals but at high concentrations, lowering in hemoglobin levels had been observed at all time intervals though elevated total leucocyte count had been observed at all concentrations and time intervals. Regarding to biochemical parameters significant increase in serum cholesterol and SGPT enzyme levels observed in Malathion pesticide exposed fishes.

Keywords: Cholesterol; Hemoglobin; Malathion; OP; SGPT; TLC.

Introduction and Conceptual Framework

In this rapidly developing, capitalist world, people are continually exposed to numerous environmental pollutants such as industrial waste, polluted air and pesticides. These invariably comprise complex mixtures of chemicals. The effects of the mixtures and their mode of action in humans are insufficiently well studied. The majority of pollutants are potentially toxic for organisms, some being connected to disease development. In this context, the increase of chronic degenerative disease including cancer in humans is of considerable concern [1].

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Pesticides are a very important group of environmental pollutants used in intensive agriculture for protection against diseases and pests [2]. Function wise they are divided into herbicides (protection against weeds), insecticides (against insects), fungicides (against fungi), and others. While their use improves the quantity of agricultural products, it potentially affects their quality, as pesticides may enter human diet [3].

Organophosphorus compounds or organophosphates (OPs) form a large group of chemicals used over the past 60 years for protecting crops, livestock, human health and as warfare agents. On the basis of structural characteristics they are divided into at least 13 types, including phosphates, phosphonates, phosphinates, phosphorothioates (S=), phosphonothioates (S=), phosphorothioates (S substituted), phosphonothioates (S substituted), phosphorodithioates, phosphorotrithioates, phosphoramidothioates [1]. OPs are the most widely used pesticides worldwide and their metabolites are widespread across different populations [4, 5, 6]. The adverse short-term effects of exposure to these chemicals have been studied mostly in the nervous system, which is their primary target [7], but there is a growing concern about their possible toxic effects

in non-target tissues and (long-term) chronic effects that have not been studied in such detail. The majority of people are continually exposed to low OP concentrations, and long-term epidemiologic studies reveal linkage to higher risk of cancer development [8].

The primary mechanism of OPs toxicity is well studied – they function as inhibitors of the enzyme acetylcholinesterase (AchE). Human exposure to OPs is most frequently assessed by measurement of decrease in AchE activity. This method is relevant for professional exposure, where OP concentrations entering to body are relatively high. However, low OP concentrations, which are present continuously, do not cause significantly decreased AchE activity. Exposure of wider populations must lean on assessment of OP metabolites, such as alkylphosphate in urine (Gupta, 2006).

Metabolism

Metabolism of xenobiotics takes place mostly in the liver and to a lesser extent also in the lung and intestine. It comprises two phases; the metabolic enzymes in phase I activate the chemical with the introduction of functional groups, on which phase II reactions can take place. The phase II enzymes attach various hydrophilic groups, e.g. glucuronic acid, sulphate, glycine, glutamic acid, enabling excretion of the metabolite from the organism [9].

Mechanism of Toxicity

The toxicity of OPs depends on their chemical structure, metabolism in target organism, concentration (i.e. dose), mode of application, degree of decomposition, mode of entering organisms, etc. [3]. The best described OP toxic effects are the neurological symptoms following acute poisoning as a consequence of the primary target (AchE). Potential secondary targets and toxic effects outside the nerve system have not been well studied, but are nevertheless very important for risk assessment.

Neurotoxicity of Organophosphate Pesticides

The primary mechanism of OPs toxicity involves inhibition of the enzyme AchE. AchE is found in synaptic membranes, where it degrades, through its hydrolytic activity, the neurotransmitter acetylcholine, producing choline and acetate, a reaction important for the regulation of synaptic activity in the central and peripheral neural system. OP cholinesterase inhibitors block the function of acetylcholinesterase, causing the accumulation of excessive acetylcholine in the synaptic cleft. This causes neurotoxic effects such as neuromuscular paralysis (i.e. continuous muscle contraction) throughout the entire body [1]. Symptoms of acute OP poisoning can be divided according to the site of acetylcholine accumulation in the organism . In addition to acute symptoms, some OPs can cause other symptoms that arise a few days after exposure or poisoning with OP. Weakness in muscles and breathing difficulties usually appear 1 – 4 days after poisoning while, after 7- 21 days, weakness in peripheral muscles also occurs. The cause of these delayed symptoms is inhibition of the neuropathy target esterase (NTE) located in the neural system, rather than AchE inhibition. NTE belongs to the same group of serine esterases as AchE, however its primary role in the organism is not well known [10]. Several other neurotoxic symptoms that cannot be ascribed to AchE inhibition, but act on different secondary targets inside the neural system, have been also proposed.

Malathion is an organophosphate parasympathominetic pesticide which binds irreversibly to cholinesterase. It is widely used in agriculture, residential landscaping, public recreation areas and in public health pest control programmes such as mosquito eradication.

Organophosphates are basis of many insecticides, pesticides, herbicides and nerve agents. Impaired memory, lack of concentration, disorientation, severe depression, confusion, irritability, nightmares, delayed reaction time, drowsiness, insomnia etc are the symptoms of chronic toxicity of pesticides. A biocide is a chemical or microorganism which can exert a controlling effect on any harmful organism by chemical or biological means.

Malathion has also been used in public health mosquito control and fruit fly eradication programmes (National pesticide information center). Malathion kills insects and pests by preventing their nervous system from working properly. Malathion binds to the enzyme, acetylcholinesterase and prevents the nervous system from stopping.

Newer evidence suggests that organophosphate pesticide may cause developmental neurotoxicity at much lower doses and without depression of plasma cholinesterase levels. Some of the most common naturally occurring brain toxins that lead to neurotoxicity as a result of excessive dosage of α - amyloid, glutamate and oxygen free radicals. Higher concentration of brain toxins can lead to neurotoxicity and death (apoptosis). It is also a major cause for neurodegenerative diseases such as Alzheimer's disease.

Major action of pesticides on parasympathetic nervous system may cause bradycardia, hypotension, hypersecretion, bronchoconstriction, GI tract hypermotility, decrease intraocular pressure. Action on neuromuscular junction may lead prolonged muscle contraction.

Objective

To study the hematological parameters of hemoglobin, total leucocyte count and biochemical parameters of serum cholesterol, serum glutamate pyruvate transaminase (SGPT) in fish Clarias Batrachus exposed under different concentrations of Malathion pesticide.

Materials and Methods

The fishes collected from river Gomti, at Lucknow were brought to the biochemical laboratory in the plastic bags in natural water, washed three times in tap water and treated with 2% KMnO4 to remove external parasitic infections, normal and healthy fishes were selected for the biochemical experiment. The fishes of uniform rate (85-95 gms) and length (14.1-17.8 cms) were taken for the experiment. They were transferred to large glass aquaria and acclimatized for 96 hours. Water characteristics-temperature (^{0}C), pH, alkalinity (mg/l), hardness (mg/l) and dissolved oxygen (mg/l) were analyzed by using standard method (APHA etal; 1991) [11].

Collection of Sample

Blood was collected from caudal vessels, either by serving off the caudal end or directly from heart and ventral aorta. Anticoagulants, like EDTA, Potassium citrate, Potassium oxalate, and ammonium oxalate were used. The collected blood was transferred to clean dry test tube and allowed to clot, at 10 ^{0}C .Soon after contents of the test tube were centrifuged at 2000 rpm and serum transferred to another clean dry test tube and stored in refrigerator at 2-8 ^{0}C.

Hematological Analysis

Hemoglobin

Hemoglobin was determined by the cynomethaemoglobin method and it was expressed as gms%. 40 micro liter capillary having sample (whole blood) was diluted in 9.960 milliliters of diluent (1:250 dilution) plus lysing reagent. A vial of the properly diluted sample was placed on the lowered haemoglobin carries block. The light shield door was closed and the test was automatically completed. Hemoglobin displaced readings were in grams per deciliter of whole blood [12].

Total Leucocytes Count (TLC)

Total leucocytes were counted by the electrical conductivity method of cell counting. Count was performed on dilution of whole blood in buffered saline dilutants which had controlled chemical and electrical characteristics. A 1:250 dilution of the whole blood and lysing hemoglobin reagent was used for leucocytes count. The transducer was adjusted at the factory should that 0.3125 milliliter of sample was counted. The displayed readings for leucocyte count were in thousand of cell per cubic millimeter of whole blood [12].

Biochemical Investigations

Serum Cholesterol Estimation

Sample was placed for the estimation of serum cholesterol by the modified method of Zlatkis, A; etal (1953). 0.1 ml serum was taken in large glass stoppered test tube having 5 ml glacial acetic acid contents were filtered and 0.5 ml filtrate was taken in another glass stoppered test tube and the volume was made up to 8.0 ml with glacial acetic acid .To this 2.0 ml colour reagent (1.0 ml -10 % FeCl3 + 99.0 ml concentrated sulfuric acid) was thoroughly mixed by brisk circular motion of the test tube. Simultaneously, a blank was prepared by using glacial acetic acid in place of filtrate .The test tube were kept in dark for colour development and heat loss. Optical density was determined at 540 nm. Standard curve was plotted for gradually increasing volume of standard cholesterol solution (25 mg/dl). Cholesterol level was calculated as cholesterol mg/dl of serum [13].

Serum Glutamate Pyruvate Transaminase / Alanine Transaminase (SGPT/ALT) Estimation

SGPT was estimated according to the method of Reitman and Frankel (1957) as given by wotton (1964). 0.9ml DL-alanine solution (222mm), 0.1 ml α -ketoglutaric acid solution (20mm) was mixed to take the substrate. The substrate was taken in two separate, clean dry test tube, one for the test other for control. 0.2ml serum was added in the test tube and incubated at 37°C for 30 minutes. 1.0ml of 2,4 – dinitrophenylhydrazine solution (1mm) was

added in each test tube, 0.2ml serum was added to control and mixed thoroughly. Then 10.0ml of 0.4N NaOH was added and mixed. Optical density was determined at 505nm against water blank. SGPT level were calculated as micro mole pyruvate formed / hour / ml serum [14].

Observations & Results

Hemoglobin

The result obtained on hemoglobin level of fish *clarias batrachus*, exposed for 24 to 96 hrs to four different concentrations of Malathion have been summarized in Table 2. At lower concentration of Malathion pesticide, within short interval, was not toxic to fish, but at high concentrations caused lowering in hemoglobin levels at all time intervals.

At 2.40 mg/L Malathion concentration, interestingly, there were no change in hemoglobin levels after 24 hrs but after 48 hrs intervals an increase of 13.57% above control was observed, with increasing time intervals of 72 and 96 hrs decrease of 3.90% and 11.71% respectively, reported below control range.

At 2.70mg/L concentration, after 24 and 48 hrs of exposure hemoglobin levels increased 6.69% and 2.60% respectively above control at the end of 72 hrs a decrease of 10.41% below control was seen. Though at 2.90mg/L concentration after 24 and 48 hrs of exposure, hemoglobin levels decreased 11.71% and 21.38% respectively below control.

At the highest concentration of 3.05mg/L decrease of 30.86% below control was seen within 24 hrs and 50% fishes were died after 24 hrs.

Total Leucocytes Count (TLC)

The results obtained on total leucocytes count of *clarias batrachus* exposed for 24 to 96 hours in four different concentrations of pesticide Malathion have been summarized in Table 3.

The maximum rise of 46.35% leucocytes above control was observed after 24 hours of pesticide exposure at the highest concentration of 3.05 mg/L, while minimum was 5.90 % above control at the lowest concentration of 2.40 mg/L had been observed within 24 hours.

At 2.40 mg/L Malathion concentration, after 24, 48, 72 and 96 hours of exposures, leucocytes increased 5.90%, 18.97%, 11.73%, and 8.01% above control respectively. Though at 2.70mg/L concentration, increase of 14.17%, 15.90%, and 23.91% above control were seen after 24, 48, and 72 hours of exposure respectively.

Elevated T.L.C. percentage of 38.85, and 43.72 above control had been observed after 24 and 48 hours of exposure respectively at the Malathion concentration of 2.90mg/L. At the highest concentration of 3.05 mg/ L, 50% of fishes died after 24 hour and leucocytes were 46.35% above control.

Serum Cholesterol

The results obtained on serum cholesterol level of the fish *clarias batrachus* exposed for 24 to 96 hours, to four different concentrations of Malathion, have been summarized in Table 4.

Maximum rise of 16.75% in cholesterol level was observed after exposure of 48 hours at 2.70 mg/L Malathion. The minimum rise of 0.65 % was there at the same concentration after 24 hours.

At 2.40 mg/L malathion concentration, the levels were increased 9.99%, 2.55 %, and 5.27 % after 24, 48, 72, hours of exposure respectively, above control. The serum cholesterol level had however fallen 1.24 % below control in 96 hours.

At 2.70 mg/L concentration, slight increase of 0.65% above control was observed in 24 hours. The increase levels seen after 48 and 72 hours of exposure were 16.75% and 15.86% respectively above control.

At 2.90 mg/L concentration, 50% fishes were died after 48 hours, when the peak cholesterol level of 20.81% above control was observed. Though at 3.05 mg/L concentration 1.11 % increase was observed, after 24 hours of exposure above control.

Serum Glutamate Pyruvate Transaminase / Alanine Transaminase (SGPT/ALT)

The results obtained on SGPT levels of fish, *clarias batrachus*, exposed for 24 to 96 hours , to four different concentration of Malathion have been summarized in Table 5. The toxic effect of Malathion pesticide also marked with regard to biochemical parameter SGPT levels. At lower concentration with increasing time intervals increase in SGPT level were more pronounced as compared to higher concentration and shorter time intervals.

At 2.40 mg/L Malathion concentration, after 24, 48, 72 and 96 hrs of exposure SGPT enzyme levels were increased 5.79%, 10.67%, 5.18%, and 15.85% respectively above control range. While at 2.70mg/L concentration the levels were increased 11.58%, 24.08% and 27.43% above control, after 24, 48 and 72 hrs of exposure respectively.

At 2.90mg/L Malathion concentration, after exposures for 24 and 48 hrs, SGPT levels increased 7.31% and 4.25% respectively above control. Though at 3.05mg/L concentration, after exposure of 24 hours SGPT levels increased 3.04% above control, after which 50% fishes did not survived.

Table 1: Analyzed water characteristics in month September at the beginning of the experiment

Water characteristic (Sept month)	
Paramaters	**Values (mean ± S. D) Range in Parenthesis**
Temparature (° C)	**23.92 ± 1.45 (22.00-25.00)**
pH	7.22 ± 0.09 (7.10-7.30)
Alkalinity (mg/L)	118.50 ± 2.64 (115.0-121.00)
Hardness (mg/L)	114.50 ± 1.29 (113-116)
Dissolved oxygen (mg/L)	5.89 ± 0.17 (5.60 - 6.05)

Table 2: Effect of Malathion Pesticide on Hemoglobin of fish Clarias Batrachus

Pesticide conc. mg/l, no. of observation 10 in each case	**Mean±S.D Range in Paranthesis Time of Exposure in hours Control values : 10.76 ± 0.36 (10.4 - 11.12)**			
	24	**48**	**72**	**96**
2.40	10.76 ± 0.64 (10.20 - 11.20)	12.22 ± 0.31 (11.80 - 12.50)	10.34 ± 0.27 (10.00 – 10.70)	9.50 ± 0.25 (9.70 - 9.20)
2.70	11.48 ± 0.47 (10.80 - 12.00)	11.04 ± 0.38 (10.50 - 11.50)	9.64 ± 0.24 (9.30 - 9.90)	
2.90	9.50 ± 0.25 (9.20 - 9.80)	8.46 ± 0.32 (8.00 - 8.80)		
3.05	7.44 ± 0.36 (7.00 - 7.90)			

Table 3: Effect of Malathion Pesticide on Total Leukocyte Count of fish Clarias Batrachus

Pesticide conc. mg/l, no. of observation 10 in each case	**Total leucocytes count per mm Mean ± S.D Range in Paranthesis Time of Exposure in hours Control values 15,600 ±127 (15,450 – 15,750)**			
	24	48	72	96
2.40	16,520 ± 335 (15,300 – 15,750)	18,560 ± 396 (18,000 – 18,950)	17,450 ± 233 (17,100 – 17,700)	18’410 ±284 (18,100 – 18,750)
2.70	17,810 ± 270 (17,500 – 18,000)	18,080 ± 750 (17,100 – 18,800)	19,330 ± 295 (19,100 – 19,700)	
2.90	21,660 ± 207 (21,400 – 21,800)	22,420 ± 277 (22,000 – 22,700)		
3.05	22,830 + 228 (22,500 – 23,050)			

Table 4: Effect of Malathion Pesticide on Serum Cholesterol levels of Fish *Clarias Batrachus*

Pesticide conc. mg/l, no. of observation 10 in each case	**Serum cholesterol mg/dL Mean ± S.D Range in Paranthesis Time of Exposure in hours Control values (644.54 ± 56.67)**			
	24	48	72	96
2.40	730.95 ± 92.08 (605.55 – 810.73)	681.55 ± 27.09 (550.32- 902.39)	699.59 ± 59.94 (629.75- 775.69)	656.36 ± 66.32 (581.71- 730.33)
2.70	668.99 ± 74.33 (581.75- 752.81)	713.09 ± 52.92 (660.17 – 785.23)	769.55 ± 51.40 (700.81 – 815.32)	
2.90	712.99 ± 97.93 (615.06 – 810.92)	714.73 ± 58.67 (652.75 – 785.32)		
3.05	671.98 ± 80.93 (591.38 – 749.24)			

Table 5: Effect of Malathion Pesticide on SGPT levels of fish Clarias Batrachus

Pesticide conc. mg/l , no. of observation 10 in each case	S.G.P.T. µmoles formed / ml / hour Mean ± S.D Range in Paranthesis Time of Exposure in hours Control values 3.28 ± 0.38 (2.90 – 3.66)			
	24	48	72	96
2.40	3.47 ± 0.26 (3.28 - 3.66)	3.63 ± 0.12 (3.54 – 3.72)	3.45 ± 0.29 (2.57 – 4.09)	3.80 ± 0.38 (3.42 – 4.18)
2.70	3.66 ± 0.53 (3.28 - 4.04)	4.07 ± 0.58 (3.57 – 4.71)	4.18 ± 0.54 (3.80 – 4.57)	
2.90	3.52 ± 0.53 (3.14 - 3.90)	3.42 ± 0.38 (3.04 – 3.80)		
3.05	3.38 ± 0.55 (3.40 – 3.93)			

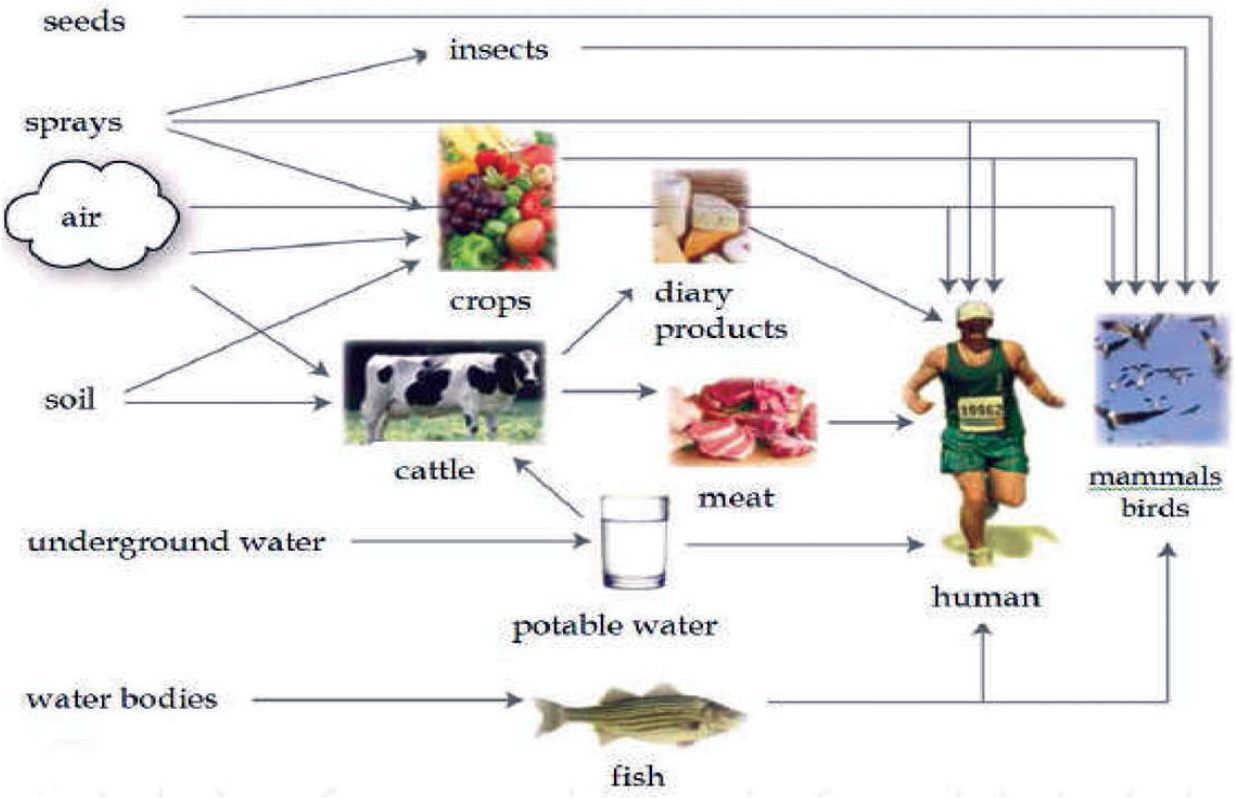

Fig. 1: Routes of Exposure to Organophosphates (adapted from WHO, 2001)

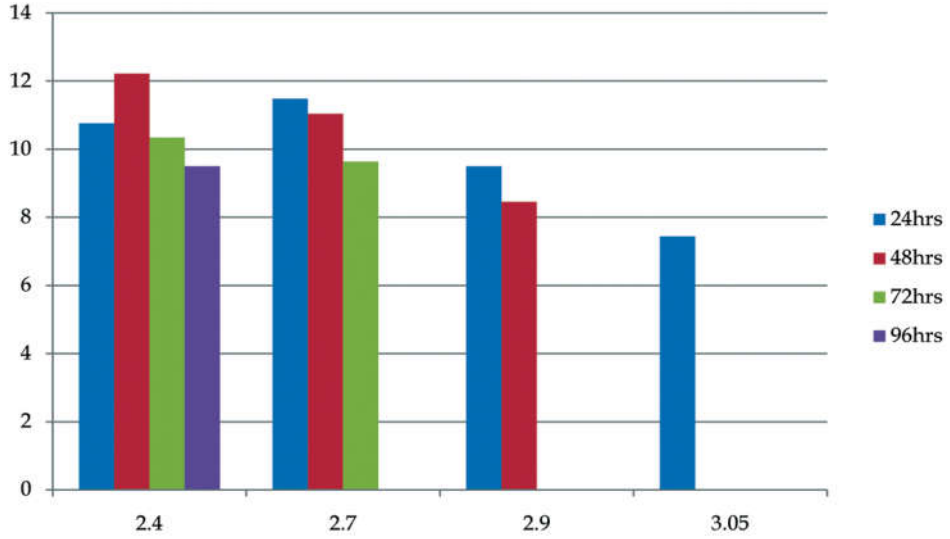

Fig. 2: Effect of Malathion Pesticide on Hemoglobin in fish Clarias Batrachus

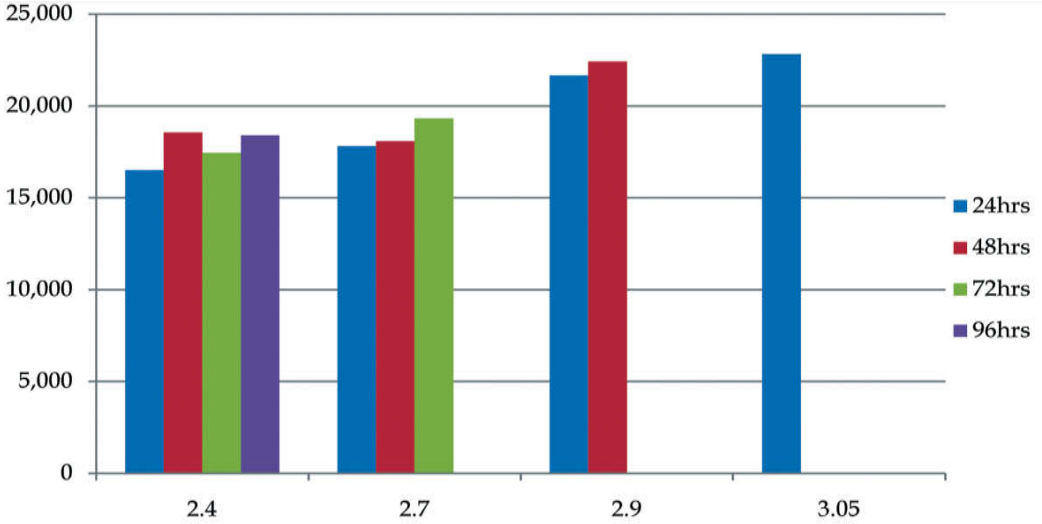

Fig. 3: Effect of Malathion Pesticide on Total Leukocyte Count of fish Clarias Batrachus

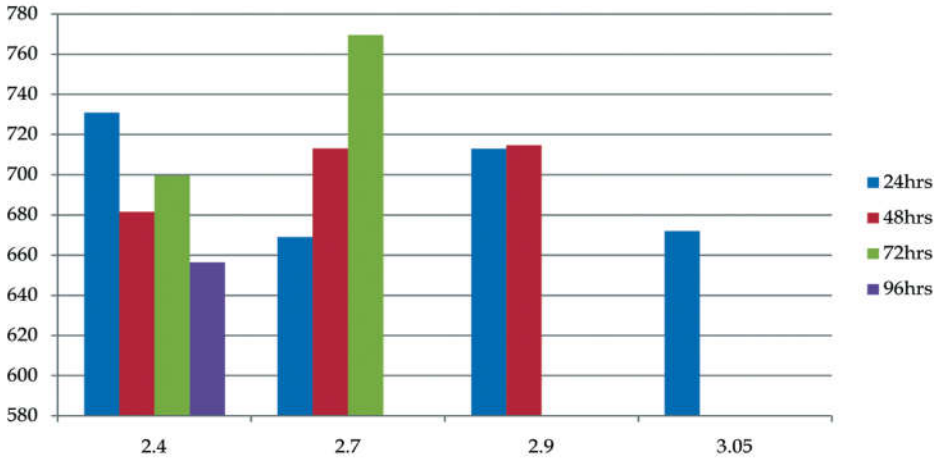

Fig. 4: Effect of Malathion Pesticide on Serum Cholesterol levels of Fish Clarias Batrachus

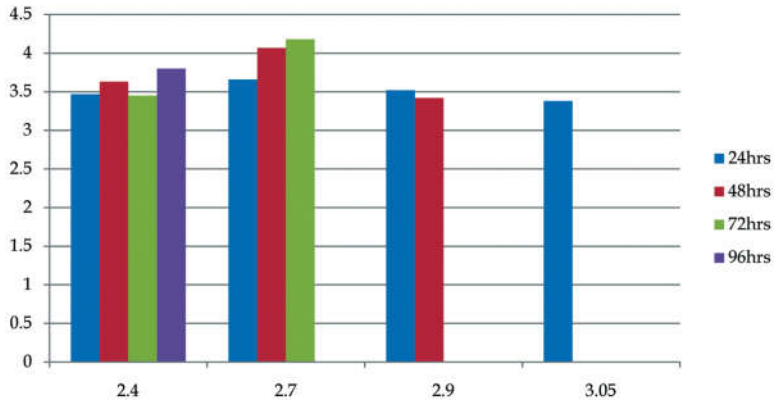

Fig. 5: Effect of Malathion Pesticide on SGPT levels of fish Clarias Batrachus

Conclusion and Recommendation

Leucocytosis, altered hemoglobin, hypercholesterolemia and elevated SGPT are result of toxicity of Malathion pesticide in fish Clarias Batrachus. The elevated cholesterol and SGPT are the biochemical markers for bioclinical stress such as Myocardial infarction (MI), Atherosclerosis, CAD, Heart attack, biliary Obstruction, Liver Cirrhosis etc. Leukemia and Myloproliferative disorders are indicator of leucocytosis in human beings. Low hemoglobin levels are predictor of increased risk of death among heart failure patients (Journal of the

American Heart Association). High hemoglobin levels may be indicators of bone marrow dysfunction, kidney cancer, liver cancer, polycythemia vera etc in human beings. On the basis of this conclusion it is advised to pesticide sprayers to take all the precautions regarding protection from pesticide exposure and suitable use of prophylactic supplements for healthy life style.

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References

1. Gupta, R.C. Toxicology of Organophosphate & Carbamate Compound. Elsevier Academic Press. 2006.
2. Gavrilescu, M. Fate of pesticides in the environment and its bioremediation. Eng Life Sci. 2005; 5(6): 497-526.
3. Grliæ, L. Mali kemijski leksikon Napried, Zagreb 1988.
4. Aprea, C.; Strambi, M.; Novelli, M.T.; Lunghini, L. & Bozzi, N. Biologic monitoring of exposure to organophosphorus pesticides in 195 Italian children. Environ Health Perspect. 2000; 108(6): 521-5.
5. Barr, D.B.; Bravo, R.; Weerasekera, G.; Caltabiano, L.M.; Whitehead, R.D. Jr.; Olsson et al. Concentrations of dialkyl phosphate metabolites of organophosphorus pesticides in the U.S. population. Environ Health Perspect. 2004; 112 (2): 186-200.
6. Curl, C.L.; Fenske, R.A. & Elgethun, K. Organophosphorus pesticide exposure of urban and suburban preschool children with organic and conventional diets. Environ Health Perspect. 2003; 111(3): 377-82.
7. Gupta, S.; Stravitz, R.T.; Dent, P. & Hylemon, P.B. Down-regulation of cholesterol 7alpha-hydroxylase (CYP7A1) gene expression by bile acids in primary rat hepatocytes is mediated by the c-Jun N-terminal kinase pathway. J Biol Chem. 2001; 276(19): 15816-22.
8. Brown, L.M.; Blair, A.; Gibson, R.; Everett, G.D.; Cantor, K.P.; Schuman, L.M. et al. Pesticide exposures and other agricultural risk factors for leukemia among men in Iowa and Minnesota. Cancer Res. 1990; 50(20): 6585-91.
9. Josephy, P.D. & Mannervik, B. Molecular Toxicology. New York: Oxford University Press. 2006.
10. Kamanyire, R. & Karalliedde, L. Organophosphate toxicity and occupational exposure. Occupational Medicine-Oxford. 2004; 54(2): 69-75.
11. A. P. H. A. (American Public Health Association). standard methods for the examination of water and waste water, 14th Ed. American Public Health Association New York. 1991.
12. Wintrobe, M.M. Clinical Haematology, Lea and Febiger, USA. 1957.
13. Zlatkis A; Zak B. and Boyle A.J. J.Lab clin.Med. . 1953; 41: 486–92.
14. Reitman.S., Frankel.S. A colorimetric method for the determination of serum glutamic oxaloacetic and pyruvic transaminase. Amer.j.clin.Path. 1957; 28: 56–63.

Original Article

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Study of Lip Prints as an Aid to Forensic Methodology

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Abstract

Background: Human identification is one of the most demanding subjects and is based on scientific principles, the object of which is to identify and register individuals for both civil and criminal purposes. *Aim and Objective:* To check whether there are any peculiar/common lip patterns among males and females and to establish lip prints as a tool for identification. *Study Design:* It's a cross sectional Prospective study. *Method:* It was conducted on the children who are studying in Sixth standard to Tenth standard in the Local schools at Narketpally. 170 subjects were selected irrespective of their caste, religion, dietary habits & socio-economic status. *Observation:* Among males, it was found that intersected pattern was most common in compartments 1, 3 and 4, while the least common pattern in lip compartments 1, 2, was Undetermined. On evaluation of the lip prints of the females, compartments 1, 2 exhibited intersected pattern predominantly. However, in compartment 3 and 4, branched pattern was commonest. *Conclusion:* Lip prints are useful in personal identification and they differ from person to person even not similar in uniovular twins. Study showed that cellophane tape and lipstick can be easily used to retrieve lip prints. Lip print analysis is a process that can provides both qualitative and quantitative results.

Keywords: Forensic Identification; Lip Prints; Cheiloscopy.

Introduction

Identity is a set of physical, functional or psychic, normal or pathological characteristics which define an individual. Human identification is one of the most demanding subjects and is based on scientific principles, the object of which is to identify and register individuals for both civil and criminal purposes [1].

In India, as well as all over the world today, crimes of diverse nature are on the rise. Both educated elite of the society and criminals are using sophisticated techniques while committing their crimes, to put the forensic, police, and the public off the scene. Hence, the role of crime detectives has become tough than ever in this sophisticated modern world. As crime scene investigation procedures are becoming more systematic and scientific, criminals are coming up with novel techniques to beat them. Post-mortem reports and finger-prints of late, the DNA fingerprinting methods are being used to take out convincing evidence in a court of law. Forensic Pathologist plays a vital role in the identification of human remains [2-3].

The wrinkles and grooves on the labial mucosa (called sulci-labiorum) form a characteristic pattern called "lip prints," the study of which is referred to as Cheiloscopy [4-9]. Cheiloscopy is a new and less recognized forensic investigation technique that deals with the identification of humans based on lip prints.

The significance of Cheiloscopy is linked to the fact that lip prints are inherent, once developed at the 6th month of intrauterine life they are permanent, unalterable even after death, and unique to each person except for monozygotic twins. It has also been confirmed that lip prints recover after undergoing

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alterations such as inflammation, trauma, and diseases like herpes and that the disposition and form of the furrows does not vary with environmental factors [10]. However, major trauma to lips may lead to pathosis, scarring and the surgical treatment given for lip rectification may alter the shape and size of the lips, thereby altering the pattern and morphology of grooves [11].

Cheiloscopy can be used as an invaluable tool in individual identification. There have been instances where "Cheiloscopy" has landed criminals behind bars, substantiating its acceptance in the court of law. Cheiloscopy can open new horizons in individual identification, be it crime scene or mass disaster. The present study was aimed to study the lip prints of different individuals in different parts of the lip and find out the incidence of any particular pattern in the given age group in relation to specific gender.

Historical Perspectives

R. Fischer was the first to describe it in 1902[12]. Use of lip prints in personal identification and criminalization was first recommended in France by Edmond Locard [13]. In 1950, Synder was the first person who suggested the idea of using lip print for identification. LeMoyne Snyder in his book Homicide Investigation, written as early as 1950, mentions the possible use of lip prints in the identification of individuals [14].

In the period 1968 1971, two Japanese scientists, Y. Tsuchihashi and T. Suzuki [15] examined 1364 persons at the Department of Forensic Odontology at Tokyo University. Based on this research, it was established that the arrangement of lines on the red part of human lips is individual and unique for each human being. This statement led to the conclusion that there is a possibility of using the arrangement of furrows (on a trace, in a linear form) on lips for the identification of a person. In Poland, the interest in lip prints started in 1966 when a lip print was revealed on window glass at the scene of a burglary [16].

Classification by Suzuki and Tsuchihashi 1970 [15].

Type I: Clear-cut vertical grooves that run across the entire lips.

Type I': Similar to Type I, but do not cover the entire lip.

Type II: Branched grooves (branching Y-shaped pattern).

Type III: Criss-cross pattern.

Type IV: Reticular, typical checkered pattern, fence like.

Type V: Undetermined, grooves do not fall into any of the types and cannot be differentiated morphologically

Material and Method

Present study is a cross sectional prospective study, it was carried by the department of Forensic Medicine of Kamineni Institute of Medical Sciences Narketpally, on the children who are studying in Sixth standard to Tenth standard in the Local Government schools at Narketpally. 170 subjects were selected irrespective of their caste, religion, dietary habits and socio-economic status. Sufficient permissions and consents were procured before the study of the children is taken and clearance from the Institutional Ethical committee is obtained in advance. Investigators were trained for recording and analyzing lip prints. Calibration was done by recording lip prints of 10 students initially successively. Each student was examined twice and the results were compared, to know the diagnostic variability agreement.

Materials used: Dark shaded lip stick, Ear buds, Cellophane tape, White paper (Proforma for recording lip prints), Scissors, Magnifying lens and sanitary tissues (to wipe the lip stick).

Technique: The subjects were made to sit comfortably in an erect position. Lips of all the subjects were cleaned and wiped dry with tissue paper before the procedure. Dark colored lipstick was applied with a single stroke evenly on the lips. The subjects were asked to rub both the lips to evenly spread the applied lipstick. A neat strip of transparent cellophane about 20 cm was cut and the glued portion of cellophane tape strip was placed over the lipstick. The lip impression was made in the normal rest position of the lips by dabbing in the center first and then pressing it uniformly toward the corner of the lips. The subjects were asked to relax and then the cellophane strip was removed from the lips in a single stroke and then stuck to a white paper for permanent record purpose. The lip print procured was examined using a magnifying lens to confirm whether the print has been properly reproduced. These prints were examined using magnifying glass, classified, and analyzed. While studying the various types of lip prints, each individual lips were divided into four equal compartments, i.e., two compartments on each lip, and were allotted the digits 1to 4 in a clock-wise sequence starting from the subjects upper right.

Statistical Analysis

The collected data were analyzed using SPSS version 18 (SPSS Inc., Chicago)

Inclusion Criteria

Subjects willing to participate in the study.

Subjects free from any active or passive lesions on their lips.

Exclusion Criteria

Gross deformities of lips like cleft lip, ulcers, and traumatic injuries on lips.

Known allergy to the lip stick used.

Observation

Total 170 children were included in the study, comprising in various age groups starting from 11 years to 16 years who are school going children. Girls 88 and Boys were 82 among them.

Fig. 1: Class wise Strength of Students

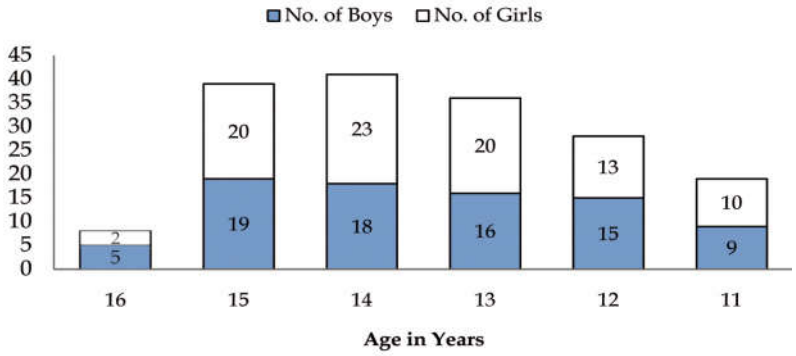

Fig. 2: Age and Sex Distribution of the Students

Table 1: Lip Print pattern in Boys and Girls

Lip Print	Males	Females
Pattern	(n=82x4=328)	(n=88x4=352)
Vertical	47 (14.32%)	67 (19.03%)
Branched	48 (14.63%)	98 (27.84%)
Intersected	114 (34.75%)	109 (30.96%)
Reticular	38 (11.58%)	32 (9.09%)
Undetermined	31 (9.45%)	27 (7.67%)
Poor quality	50 (15.24%)	19 (5.39%)

Table 2: Lip print patterns in each lip compartment of Males and females

Lip	Lip Print	Males	Females
Compartment	**Pattern**	(n=82x4=328)	(n=88x4=352)
I	Vertical	23 (28.04%)	19(21.59%)
	Branched	10 (12.19%)	18 (20.45%)
	Intersected	23 (28.04%)	22(25.0%)
	Reticular	6 (7.31%)	2 (2.27%)
	Undetermined	4(4.87%)	6 (6.81%)
	Poor Quality	16 (19.51%)	14 (15.90%)
II	Vertical	9 (10.97%)	16 (18.18%)
	Branched	24(29.26%)	11 (12.5%)
	Intersected	18 (21.95%)	43 (48.86%)
	Reticular	10 (12.19%)	9 (10.22%)
	Undetermined	6 (7.31%)	4 (4.54%)
	Poor Quality	13 (15.85%)	3 (3.40%)
III	Vertical	9 (10.97%)	12 (13.63%)
	Branched	4 (4.87%)	38 (43.18%)
	Intersected	41 (50.0%)	27 (30.68%)
	Reticular	14 (17.07%)	8 (9.09%)
	Undetermined	9 (10.97%)	8 (9.09%)
	Poor Quality	12 (14.63%)	2 (2.27%)
IV	Vertical	6 (7.31%)	20 (22.72%)
	Branched	10 (12.19%)	31 (35.22%)
	Intersected	32 (39.02%)	17 (19.31%)
	Reticular	8 (9.75%)	13 (14.77%)
	Undetermined	12 (14.63%)	9 (10.22%)
	Poor Quality	9 (10.97%)	0 (0.00%)

As per table no1 when the overall pattern was evaluated among all the lip compartments of the study subjects, it was found that intersecting pattern was most common among both males and females having 34.75% and 30.96% respectively. However, the least common was the undetermined pattern seen in 9.45% males and 7.67% females. The intersecting pattern was found to be most common among upper and lower lips of both males and females. The analysis of lip print type in each compartment was done. Among males, it was found that intersected pattern was most common in compartments 1, 3 and 4 having 28.04, 50.0 and 39.02 %, respectively, while the least common pattern in lip compartments 1, 2, was Undetermined with 4.87% and 7.31% respectively while in 3rd compartment Branched patter was least common with 4.87% and in 4th compartment Vertical pattern was least common with 7.31%. On evaluation of the lip prints of the females, compartments 1, 2 exhibited intersected pattern predominantly having 25.0% and 48.86% respectively. However, in compartment 3 and 4, branched pattern was commonest with 43.18 and 35.22% respectively. Lip compartments 1 of the females showed the reticular pattern as the least common having 2.27%, while compartment 2, 3 and 4 had poor quality lip prints least in number.

Discussion

Crimes challenge the society in detection, diagnosis and identification of criminals. Establishing a person's identity can be a very difficult process. The most commonly used techniques like the fingerprint, DNA and Dental identification cannot always be used. Hence the search for various other means of personal identification continues. It is known that due to their special features, both lip grooves and palatal rugae can be used successfully in human identification [17, 18]. Lip prints are very useful in forensic investigation and personal identification. They are considered to be most important forms of transfer evidence, and are analogous to finger prints.

Among males, it was found that intersected pattern was most common in compartments 1, 3 and 4, while

the least common pattern in lip compartments 1, 2, was Undetermined. On evaluation of the lip prints of the females, compartments 1, 2 exhibited intersected pattern predominantly. However, in compartment 3 and 4, branched pattern was commonest. These results of our study do not coincide with that by Vahanwala and Parekh who showed the Y-pattern dominant in females in third and fourth quadrants and end-to-end pattern common among males in second quadrant [21].

A detailed study of each lip print showed that each print is unique. This supports the findings of the earlier studies regarding the uniqueness of lip prints [19-25]. Thus, lip prints can be effectively used for personal identification. Hence Lip prints can be used to verify the presence or absence of a person from the crime, provided there has been consumption of beverage, drinks, usage of cloth, tissue/ napkin etc. at the crime scene [6]. Smears can also be found in other places, such as glasses, cups, spoons or cigarette butts, therefore indicating some kind of relationship between a suspect and the crime scene [21]. At scene of crime Investigating officers looks for finger prints at all possible places, presence or absence of finger prints is conclusive of the fact that the person suspected was either present or absent on the scene of crime, likewise the lip print being uniform throughout the life and individualistic can be used to verify the presence or absence of a person from the scene of crime. Lip marks can be observed on ordinary drinking glass by an individual, even without lipstick being applied. Hence taking lip prints of all the suspected individuals and comparing with any such item found at the scene of crime could give conclusive evidence. Presence/ absence of a person and should be admissible even in the court of law. The other investigations become easier, once the presence/absence of a suspect from the scene are confirmed. In an investigation, Dr. Anil Aggarwal [26] has proved beyond doubt that lip prints are as good as finger prints in criminal identification and can be definitely used when no other means of traditional methods of identification are available.

Heredity and Lip Print

In our study we had a pair of twin, uniovular type were studied in details in all 04 quadrants. It was similar to in few quadrants, but one or the other give different pattern, it was consistent with the study of Mc donell who reported that two identical twins seemed to be indistinguishable by every other means but their lip prints were not identical. This was different from study by Tsuchihashi et al [20] in which they found similar lip prints in twins and their parents. Though the size of samples for twin in our study was small but even one case of uniovular twins showing different pattern creates doubts for heredity in lip print identification.

Conclusion

When individual identification is concerned, Lip prints can be used as an aid, where other commonly used identification sources are not available. Lip prints are useful in personal identification and they differ from person to person even not similar in uniovular twins. Study showed that cellophane tape and lipstick can be easily used to retrieve lip prints. Lip print analysis is a process that can provides both qualitative and quantitative results; however, more research should be done to make its application widely accepted in the forensic field. Research suggests the conclusive evidence that lip prints are suitable for the successful comparison, analysis, and identification of a person to a crime. In fact, there have been convictions of perpetrators who were positively identified via the analysis of their known lip prints to those found at the crime scene. There is a need to develop one cohesive Cheiloscopy system. If police keep record of lip print with them along with fingerprint, it will help to solve the crime and can justify the real sinner. However, as far as the legal matters in Indian judicial system are concerned, this technique needs to be used more frequently in routine civil and criminal litigations.

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References

1. Rastogi P, ParidaA. Lip prints–An aid in Identification.Aust J Forensic Sci. 2011; 44: 1-8.
2. Amith HV, Ankola AV, Nagesh L. Lip prints - Can it aid in individual identification. J Oral Health Community Dent 2011; 5: 113-8.
3. Nishat A Sheikh et al. Cheiloscopy: A Tool for Solving Crime and Identification. Indian Journal of Forensic Medicine and Toxicology. July-Dec., 2012; 6(2): 133 -135.
4. Romm S. On the beauty of lips. Clin Plast Surg. 1984; 11: 571-81.
5. Ball J. The current status of lip prints and their use for identification. J Forensic Odontostomatol. 2002; 20: 43-6.
6. Sharma P, Saxena S, Rathod V. Comparative reliability of Cheiloscopy and palatoscopy in human identification. Indian J Dent Res. 2009; 20: 453-7.
7. Cottene JA, Standish SM. Text Book of Outline of Forensic Dentistry; Special Tech (Cheiloscopy). 1 st ed, Chicago. 1982; pp. 77-111.
8. Sharma P, Saxena S, Rathod V. Cheiloscopy: The study of lip prints in sex identification. Forensic Dent Sci. 2009; 1: 24-7.
9. Rajendran R, Sivapathasundharam B. Shafer's Textbook of Oral Pathology. 6th ed. New Delhi: Elsevier. 2006; pp. 896-7.
10. Nishat Ahmed Sheikh et.al. A study of Finger Prints in Relation to ABO Blood Group and Gender. Indian Journal of Forensic Medicine and Pathology. October - December 2014; 7(4): 141-146.
11. Dwivedi N, Agarwal A, Kashyap B, Raj V, Chandra S. Latent lip print development and its role in suspect Identification. J Forensic Dent Sci. 2013; 5: 22-7.
12. Kasprzak J. Possibilities of Cheiloscopy. Forensic Sci Int. 1990; 46: 145-51.
13. Snyder LM. Homicide Investigation, 2nd ed. Springfield: Charles C. Thomas.1967; pp. 65.
14. Synder LM. Textbook of homicide investigation. Identification of dead bodies. 1950.
15. Suzuki K, Tsuchihashi Y. Personal identification by means of lip prints. J Forensic Med 1970; 17: 52-7.
16. Saraswathi TR, Mishra G, Ranganathan K. Study of lip prints. J Forensic Dent Sci. 2009; 1: 28-31.
17. Caldas IM, Magalhaes T, Afonso A. Establishing identity using Cheiloscopy and palatoscopy. Forensic Sci Int; accepted 21 April 2006. Article in Press. Available from URL: http:// www.science direct.com/sdarticle.pdf.
18. Limson KS, Julian R. Computerized recording of the palatal rugae pattern and an evaluation of its application in forensic identification. J Forensic Odontostomatol 2004; 22(1): 1-4.
19. Sivapathasundharam B, Prakash PA, Sivakumar G. Lip prints (Cheiloscopy). Ind J Dent Res. 2001; 12(4): 234–237.
20. Tsuchihashi Y. Studies on personal identification by means of lip prints. Forensic Sci. 1974; 3: 233–248.
21. Vahanwala SP, Parekh BK. Study of lip prints as an aid to forensic methodology. J Forensic Med Toxicol. 2000; 17(1): 12–17.
22. Suzuki K, Tsuchihashi Y. A new attempt of personal identification by means of lip print.Can Soc Forensic Sci. 1971; 4: 154–158.
23. Jaishankar S, Jaishankar N, Shanmugam S. Lip prints in personal identification. J Indian Acad Dent Specialists. 2010; 1(4): 23–26.
24. Singh S, Chhikara P, Singroha R. Lip Prints as evidence. J Punjab Acad Forensic Med Toxicol. 2011; 11(1): 23–25.
25. Lip prints identification anyone? Available online at http://www.forensic-evidence.com/ sie/ID/ ID00004_10.html.
26. Aggarwal A. The importance of lip prints (Forensic Files). Available from: http:// lifeloom.com// II2Aggarwal.htm. 24th Oct 2008.

Review Article

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History and Modalities of Forensic Radiology

Kusum Singal

Abstract

Forensic Radiology is a specialized area of medical imaging utilizing radiological techniques to assist physicians & pathologists in matter pertaining to the law. It comprises the performance, interpretation and reportage of the radiological examinations and procedures which are needed in court procedures or law enforcement. Radiological methods are widely used in identification, age estimation and establishing cause of death. This article describes the history and modalities of forensic radiology.

Keywords: Forensic Radiology; Virtopsy; 3D; Imaging; MRI; Conventional.

Inroduction

The routine diagnostic imaging methods are used in forensic biomedical practice and research. Studies in the field have resulted in the establishment of forensic stan-dards, as in the fields of skeletal development and maturation. For example, laryngeal car-tilages undergo age changes, including mineralization and ossification, a recent study analysed the degree of laryngeal radiopacity to determine whether radiog-raphy of the larynx can be used routinely in forensic pathology to estimate age at death. The study found a positive correlation between the total score of laryn-geal radiopacity and age. It was concluded that radiological methods are simple, fast, non destructive, and has a good reproducibility among observers [1].

Rapid technical advances have occurred in radiology in so many years. Many of these new techniques and modalities have also been embraced and modified by the forensic science community. Examples include con-trast techniques for the study of cadaver arterial systems, the use of solidifying rubber with lead oxide in autopsy studies of vascular structures, and similar contrast tech-niques for demonstration of esophageal, tracheal, and aortic fistulae. As in clinical medicine, the usefulness of MRI and CT in forensic radiology has been demonstrated. For example, one study looked at the feasibility of circum-venting the classic forensic autopsy by replacing it with a full-body CT scan [2, 3, 4].

Complete volume data of the head, neck, and trunk were acquired using two acquisitions with less than one minute of total scanning time. Sophisticated reformation tech-niques helped document the gunshot-created skull frac-tures and brain injuries, including the wound track, and the intra cerebral bone fragments. CT also demonstrated intra cardiac air embolism and pulmonary aspiration of blood resulting from wound-related trauma. The study concluded that, the so-called digital autopsy, even when post processing time was added, was more rapid than the classic forensic autopsy and, based on the non destructive approach, offered certain advantages in comparison with the forensic autopsy [5].

Autopsy is the scientific examination of bodies after death, where whole surface of the body as well as all the body cavities are explored to record the findings. It is long back that the autopsy procedures were invented and till now the same age old techniques for autopsy are being used, though in the other fields of Forensic Medicine, there is rapid growth and advancement in the procedures performed and technology employed. Virtopsy is one step towards this end [6].

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The term "virtopsy" was created from the terms "virtual" and "autopsy." The former term is derived from the Latin word *virtus*, which means "useful, efficient, and good." The term "autopsy" is a combination of the classical Greek terms *autos* ("self") and *opsomei* ("I will see"). Thus, autopsy means "to see with one's own eyes." Because goal was to eliminate the subjectivity implied by *autos*, research merged the terms "virtual" and "autopsy"- deleting *autos*- to create the term "virtopsy" [2].

Virtopsy basically consists of *(a)* body volume documentation and analysis using CT, MR imaging, and microradiology; and *(b)* 3D body surface documentation using forensic photogrammetry and 3D optical scanning. The resulting data set contains high-resolution 3D colour-encoded documentation of the body surface and 3D volume documentation of the interior of the body. By manipulating the data set with volume-rendering (VR) tools at a workstation, one can perform a virtual autopsy anytime, in any place. No forensic findings are disturbed, as they would be by the destructive techniques used in traditional autopsy [8].

The Virtopsy or "virtual autopsy" was developed by Richard Dirnhofer, former Director of Forensic Medicine, Berne, which was then continued by his successor, Michel Thali and his colleagues at the University of Berne's Institute of Forensic Medicine, Switzerland. "If you are doing an autopsy, you are always destroying the 3-D geometry of the body," says Thali, the forensic pathologist and project manager for Virtopsy. "Using this cross-section imaging technique, it is possible to document the same findings in a non invasive way" [8].

The Imaging Techniques Applied in Virtopsy

Whenever a photograph is taken, it always gives a two dimensional view of the particular object. So, if a wound photograph is taken, it will give the position, as well as length and breadth of the wound but cannot display the depth of the wound. So for determination of the depth, a three dimensional view of the wound is essential to understand the actual dimensions. So, in Virtopsy, there is combination of the technologies of medical imaging techniques as well as other technologies used in other field of science. 3-D surface scan used in the automobile designing is used to map the exterior of the body. It gives and documents the three dimensional image of the body surface area in detail [8].

- Multi-slice computed tomography (MSCT) and
- Magnetic resonance imaging (MRI)–which visualizes the interior of the body for collection of all the data in details in regards of condition of different organs. One can examine the part of the body slice by slice in different planes according to the requirement of the situation [8].

Apart from these, using the magnetic resonance imaging spectroscopy, time since death can also be estimated by measuring metabolites in the brain, emerging during post-mortem decomposition. The samples for histopathological examination if required can be collected more precisely using CT guided needle biopsy. Postmortem angiography is used to visualise the cardiovascular system [3,4].

Michael Thali and colleagues at the University of Berne's Institute of Forensic Medicine, has studied in more than 100 autopsies in Switzerland and the findings of the Virtopsy procedure has matched almost perfectly in side by- side comparisons with those of the conventional autopsy procedures. The comparisons were checked for a number of forensically pertinent points such as detection of gas, fractures and foreign bodies, as well as tissue and organ trauma. When teamed with post-mortem angiography and biopsy procedures, Michael Thali says that there is little of forensic importance that the virtual autopsy cannot detect [2, 5].

The 'Surface scanner' is the means for measuring and depicting the images in three dimensional views with precision. The object is photographed from different angles using digital camera which is then fed in to a computer. The body is scanned from all sides using a sensor which takes pictures using two cameras. The computer then reproduces the image of the body in three dimensional views which can be rotated as per requirement without any distortion for collection of the findings [8].

In the initial period, In Virtopsy, researchers use only the CT and the MRI for detection of the findings; but in that method, there were limitations as the images formed were only in grayscale, and so many findings were difficult to appreciate. But the new combined method of 3-D/CAD-supported photogrammetry and the medical imaging technique like the MSCT, MRI etc., give a much better result. Using this merging method of coloured photogrammetric surface scan and gray-scale radiological internal documentation, a great step towards a new kind of reality-based, high-tech wound documentation and visualization in forensic medicine is made. The combination of the methods of 3D/CAD Photogrammetry and Radiology has the advantage of being observer-independent, non-subjective, non-invasive, digitally storable over years or decades and even transferable over the web for second opinion. Moreover, by using this method,

matching of the weapon of offense or the offending object with the wound can be made [9].

Using the post-mortem angiography, the whole cardiovascular system can be visualised. If there is any injury to a vessel, there will be spillage of the dye to the surrounding tissues, making it visible in the CT images. So, minute injuries to the blood vessels even to a capillary also can be detected in this method which is usually missed in the conventional autopsy. Apart from that, it is not possible to determine the findings in the heart muscles immediately after an ischemic attack, and so using this technique, the coronary vessels can be better assessed for any occlusion etc. than in case of the conventional autopsy [9].

Application of Minimally Invasive Techniques

To allow tissue specimens to be obtained for histologic analysis, a minimally invasive, radiological imaging guided biopsy technique was implemented for forensic use in corpses. This technique makes it possible to obtain not only tissue specimens but also samples of urine, bile, or blood for toxicologic or DNA investigations [4].

Application of Micro Radiologic Techniques

Emerging technologies such as high-resolution CT (micro-CT) and MR microscopy (micro– MR imaging) provide images with high spatial resolution [2]. With sub millimeter resolution, MR microscopy is a promising technique in the study of injury patterns in soft tissues [5]. MR microscopy can be used to analyze electrical injury patterns on human skin or to document specific ophthalmologic findings that might indicate shaken baby syndrome when the circumstances exclude an alternative explanation [10]. Micro-CT and micro– MR imaging might be used to perform microvirtopsy on forensic tissue specimens prior to destructive sectioning [10].

With the help of advanced graphic software, 3D data sets collected from intact specimens can be post processed to show different views (multiplanar reformatted images, 3D displays), digitally isolate (segment) 3D structures, and quantify volumes and surface areas for morphometry [10].

3D Colour-Encoded Surface Scanning

Skin and bone injuries are 3D. With conventional documentation methods like photography, 3D objects are unfortunately displayed in only two dimensions, which can sometimes be insufficient for forensic and scientific analysis. The forensic application of the TRITOP/ATOS II system (GOM) consists of 3D documentation of the formed injury on the body (skin, bone) and of the weapon (injury-causing instrument) that was presumably used [11].

The suspected weapon can be documented three dimensionally in the same way. Both 3D models are real data– based, and their sizes and dimensions are calibrated. Subsequently, the use of the suspected weapon can be confirmed or excluded on the basis of the correspondence between the weapon and the formed injury. Thus, a weapon that turns up months or even years after autopsy has been performed can be linked to patterned injuries on the body. After the weapon is scanned, attempts at correlation are made in a virtual 3D space. Possible morphologic correlations range from that between small bite wounds and the dentition of possible offenders to that between patterned injuries on the body of a traffic accident victim and the possible involved vehicle [11].

Fusion of Cross-Sectional and 3D Surface Scanning Data

In preparation for the fusion of surface and cross-sectional volume data sets, additional "radiologic landmarks" (multi-modality markers for CT or MR imaging) can be placed on the dead bodies [10,11]. The merging or fusion process is actually carried out with specific 3D software programs. To date, various research groups has validated the following methods of fully merging surface data sets with radiologic internal body data sets in 3D: [10,11]

1. The photogrammetric data set for a smaller injury can be merged with the radiologic 3D reconstructed image of the skin or soft tissue. Visible radiologic landmarks are useful for correlating the data sets. If the wound is located in an anatomically stable region, a fusion process based on geometric anatomic fusion is possible even without radiologic markers [10,11].
2. The 3D optical surface scan, acquired with the TRITOP/ATOS II system (GOM), can be matched (merged) with the radiologic data set. This new approach holds promise for the analysis of large, widespread, or complex injuries on the body surface or for cases in which whole-body documentation is necessary [10,11].

References

1. Patowary AJ. Virtopsy: one step forward in the field of forensic medicine - a review. J Indian Acad Forensic Med. 2005: 30(1): 32-6.

2. Thali MJ, Schweitzer W, Yen K, Vock P, Ozdoba C, Spielvogel E, Dirnhofer R. New horizons in forensic radiology: the 60-second digital autopsy-full-body examination of a gunshot victim by multislice computed tomography. Am J Forensic Med Pathol. 2003; 24: 22-7.
3. Thali MJ, Taubenreuther U, Karolczak M, Braun M, Brueschweiler W, Kalender WA, Dirnhofer R. Forensic microradiology: micro-computed tomography (Micro-CT) and analysis of patterned injuries inside of bone. J Forensic Sci. 2003; 48: 1336– 42.
4. Thali MJ, Yen K, Vock P, Ozdoba C, Kneubuehl BP, Sonnenschein M, Dirnhofer R. Image-guided virtual autopsy findings of gunshot victims performed with multi-slice computed tomography and magnetic resonance imaging and subsequent correlation between radiology and autopsy findings, Forensic Sci Int. 2003; 138(1-3): 8-16.
5. Thali MJ, Marcel B, Ursula Bet al. VIRTOPSY: scientific documentation, reconstruction and animation in forensics: individual and real 3D data based geometric approach including optical body/ object surface and radiological CT/MRI scanning. J Forensic Sci. 2005; 50: 428–42.
6. Thali MJ, Braun M, Dirnhofer R. Optical 3D surface digitizing in Forensic Medicine: 3D Documentation of skin and bone injuries. Forensic SciInt. 2003; 137(2-3): 203-8.
7. Yen K, Lovbald KO, Scheurer E et al. Post-mortem forensic neuroimaging: correlation of MDCT and MRI findings with autopsy results. Forensic SciInt. 2007; 173: 21-35.
8. ThaliMJ, Yen K, Plattner T, Schweitzer W, Vock P, Ozdoba C, Dirnhofer R. Charred body: virtual autopsy with multi-slice computed tomography and magnetic resonance imaging. J Forensic Sci. 2002; 47: 1326–31.
9. Thali MJ, Dirnhofer R, Becker R, Oliver W, Potter K. Is 'virtual histology' the next step after the 'virtual autopsy'? magnetic resonance microscopy in forensic medicine. MagnReson Imaging. 2004; 22: 1131–38.
10. Thali MJ, Yen K, Schweitzer W, Vock P, Ozdoba C, Dirnhofer R. Into the decomposed body: forensic digital autopsy using multislice-computed tomography. Forensic Sci Int. 2003; 134: 109–14.
11. Tai CC, Blenkinsop BR, Wood RE. Dental radiographic identification utilizing computerized digital slice interposition: a case report. J Forensic Odonto Stomatol. 1993; 11: 22-30.

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Fatal Leopard Bite

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Abstract

The authors report a fatal case of leopard attack in rural area of Sangli district. The victim was a 10 year old boy who was roaming in farm when he was attacked. The injuries present over the neck were consistent with the big cat attack. The leopard attacks are uncommon in rural part of Sangli district and hence the case is reported.

Keywords: Leopard Bite; Medico Legal Autopsy; Injuries Around Neck.

Introduction

Fatal attacks by wild animals on humans causing fatal injuries are not uncommon in rural or forest areas of India. During autopsy of such cases of animal bites, one must be aware of the types of injuries seen in sharp force trauma cases. The ability to differentiate between animal bite marks, insect bites and other mechanisms that injures skin is vital. Knife and teeth wounds can be amazingly similar. Animal bite mark injuries and fatalities are increasing in incidence and are yet another patterned injury that should be recognized by autopsy surgeon [1,2]. Hence the present case is reported to describe the bite mark pattern produced by large cat attacks and its rarity in western Maharashtra.

Case Report

10 years old boy residing at rural part of Sangli district brought by relatives with history of animal bite (leopard) to nape of neck and lateral aspect of face. Boy was apparently alright and roaming in farm when leopard came from behind and hit him on nape of neck and face. Boy was admitted in private hospital on the same day, died in spite of treatment. Body was brought to Govt Medical College and Hospital, Miraj for medico legal post mortem examination.

On external examination boy was averagely built and nourished, having following injuries on the neck, on left side of neck two oval puncture wounds present, 4 cms apart, and one present over angle of mandible and other at the level of thyroid cartilage which was stitched (Fig. 1). Neck vessels were exposed to exterior.

On right side of neck two oval puncture wounds were present 3.5 cms apart, neck tissues deep with multiple abrasions in between them with reddish thick pus oozing from lower puncture wound. There was abscess formation beneath the said injury (Fig. 2).

Three other punctured lacerated wounds present over nape of the neck. All these injuries denote large

Fig. 1: Bite mark over left side of neck

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carnivore bite marks (Fig. 3).

Leopards have extremely long canines and a complement six incisors plus two canines for a total of eight [2]. Abrasions in between the oval punctured wounds correspond with the six incisors.

Fig. 2: Bite Marks over right side of neck

Fig. 3: Bite marks over nape of neck

Discussion

Most of the cases of animal bites or attacks presented in GMCH Miraj and PVPGH Sangli are of dog bites and crocodile bites. Crocodiles are more common inhabitants of Krishna River and cases of crocodile bites most commonly came to casualty of GMCH Miraj and PVPGH Sangli. As such leopards are uncommon in rural part of Sangli district and not a single case of leopard attack is reported in this part. The circumstances surrounding this case leave little doubt as to the identity of the perpetrator.

All large cats hold down its prey with its paw. It never attacks head on but prefers an approach from rear or shoulder, going for the nape and neck. Its canine and ripping teeth are indeed formidable, and their structure allows them to thrust these teeth deep into tissues and kill by strangulation [3, 4]. The wound is usually contaminated with the oral flora of the offending animal, with infection rates ranging from 5% to 30% [5]. Leopard attacks are usually fatal [6].

The autopsy findings are consistent with a large cat attack. The wound distribution, around head and nape of the neck, is commonly found on the pray of small and large cats such as jaguars, leopards etc. [2, 3, 4, 6, 7]. Our case also shows penetration of deep vasculature of neck which is common extension of neck wounds in big cat attacks.

References

1. C. Michael Bowers, Forensic Dental Evidence an Investigator's Handbook, (1st Ed), Elsevier Academic Press.
2. J. Stephen Vogel, John R Parker, Fred B Jordan, Thomas L Coury and Arthur R Vernino, Persian Leopard (Panthera pardus) Attack in Oklahoma. Am J For Med Pahol. 2000; 21(3): 264-269.
3. Ramin Babram, Jonthan E Burke,Head and Neck Injury From Leopard Attack: Case Report and Review of the Literature. Oral Maxillofaci Surg. 2004; 62(2): 247-249.
4. Stephen Chapernoire, Bernard Camiade,Michel Legros,Basic Instinct in a Feline, Am J For Med Pathol. 2001; 23(1): 46-50.
5. Callaham M, Dog Bite Wounds,JAMA. 1980; 224: 2327.
6. Dar G. Nabi, Shafaat Rashid Tak, K. A. Kangoo, M. A. Halwai, Comparison of Injury Pattern in Victims of Bear (Ursus thibetanus) and Leopard (Panthera pardus) Attacks. A Study from a Tertiary Care Centre in Kashmir, Eur J Trauma & Em Med. 2009; 35(2): 153-158.
7. Cohle S D, Harlan C W, Harlan G, Fatal Big cat attacks, Am J For Med Pathol. 1990; 11(3): 208-212.

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Even Small Pea Nut Proves Fatal One: A Case Report of Chocking

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Abstract

Foreign body choking are very frequent in occurrence which is mostly accidental. Though, the accidental foreign body inhalation is observed in all age group, the small children below 4 years of age are the common victims. Food related items and plastic toys are the foreign bodies commonly encountered. Food is the energy provider for the life which can become an asphyxiating agent at times. The spectrum of airway foreign bodies varies from country to country, depending on the diet and customs of the population.It can be fatal if it results in serious impairment of respiration or cardiac inhibition. Here we report a death of a two yearchild brought for autopsy who had died after aspiration of groundnuts. The boy had started grunting while eating groundnuts. He was immediately diagnosed as aspiration of groundnuts. He died within 24 hours of admission inspite of emergency removal of the two pieces of groundnut by rigid bronchoscopy.

Keywords: Accidental; Choking; Aspiration; Bronchoscopy.

Introduction

Chocking is the variety of asphyxia caused by an obstruction within the air passages. It is usually due to the inhalation of a foreign body, but it can be caused by inhalation of the products of the disease (or violence) or by anatomical changes due to disease [1]. Chocking can be partial or complete depending upon the size of the foreign body. A large foreign body may get impacted in the pharynx and completely obstructs the airflow causing death from asphyxia. While, a small object partially blocking the lumen of the larynx may cause death by laryngeal spasm. Otherwise, with partial blockage some, although inadequate, flow of air into the lungs is maintained. In such cases, the partial obstruction to the airflow can eventually become complete due to reactionary mucosal edema, hemorrhage and collection of secretions. However, all deaths due to chocking are not result of asphyxia as irritation of tracheal mucosa by foreign body may cause death by reflex parasympathetic cardiac inhibition.

It is an emergency situation which can lead to fatal outcome, if it remains unattended or not properly managed. Although, chocking incidents occur in all age group, it is most common in the pediatric age group. The most common objects on which children choke are food, coins, balloons, and other toys [2]. The accidental chocking usually occurs during eating when food is accidentally inhaled, especially when victim is laughing or crying [1]. Here we present a case of chocking by groundnut in a two year old boy. He accidentally chocked on groundnut while eating. He died due to partial chocking in spite of emergency removal of few groundnut pieces by rigid bronchoscopy.

Case Report

Atwo year male child started grunting while eating groundnuts and developed respiratory distress. His parent immediately rushed him to a nearby private hospital where diagnosed as case of foreign body aspiration was made. He was referred to the advanced ENT and multispecialty hospital at district

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place for required necessary management. ENT surgeon removed two groundnut pieces by emergency rigid bronchoscopy at that hospital. In spite of removal of foreign body, the condition of the hypoxia did not improve and patient's condition worsens. Afterwards, he was referred and admitted to our Teaching Institute with preliminary diagnosis-post foreign body aspiration pneumonitis with bronchospasm. He died after 12 hours of admission on next day morning of the accidental chocking.

The autopsy was performed in the Department of Forensic Medicine on same day of death. During autopsy, external examination showed bluish discoloration of nail beds and lips. Rigor mortis was present all over the body. No injury could be detected on the body. On internal examination, all organs were congested with evidence of cerebro-pulmonary edema. On meticulous dissection and examination of respiratory tract, whitish yellow, thick, mucoid froth completely occluding trachea was evident extending up to the vocal cords. A white half groundnut piece was found impacted at the level of origin of left main bronchus. Along with the mucosal edema and surrounding thick yellowish mucus it had completely occluded the left main bronchus.(Fig. 1 and 2) Laryngeal mucosa was edematous and congested.

Opinion as to the cause of death is "Chocking as the cause of death due to obstruction of respiratory passage by a foreign body."

Fig. 1: Shows the ground nut piece near bifurcation of trachea and mucosal edema with thick yellowish mucus surrounding it had completely occluded the left main bronchus

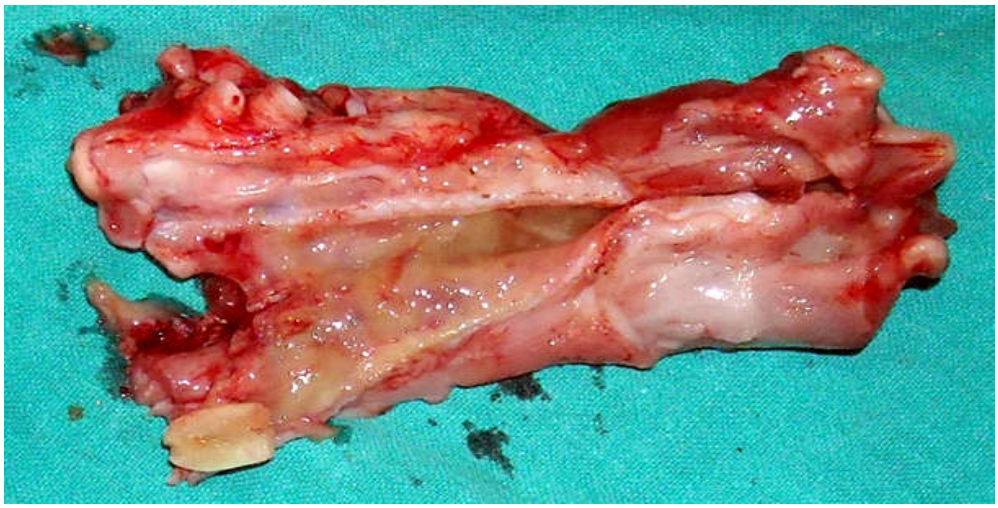

Fig. 2: Shows another piece of ground nut in lumen of right bronchus

Discussion

Chocking is a leading cause of morbidity and mortality among children, especially those who are 3 years of age or younger[2]. Uncoordinated swallowing mechanisms in young children, inability to time swallowing and breathing, immature dentition (lack of molar teeth until 3-5 years), physical activity, the habit of exploring objects with the mouth are the risk factors involved in childhood asphyxiation due to ingestion and inhalation of foreign body [3]. Chocking in the child may present with definite history of aspiration, choking followed by paroxysms of cough or may present with recurrent chest infections, or pneumonia not responding to routine antibiotic treatment [4]. In the present case the male child had complained of cough and sudden breathlessness while eating groundnuts. Males show predominance as compared to females; the reason could be more inattentiveness and lack of supervision towards male children as compared to females [4,5].

The spectrum of airway foreign bodies varies from country to country, depending on the diet and customs of the population. Vegetable matter and dry fruits have been reported to be the most commonly aspirated food in the pediatric airway [6]. Like in present case, groundnut was reported to be the most common trachea-broncheal foreign body among Indians in study conducted by Sinha et al [4]. In the study conducted by Jaswal et al [5], the most common type of trachea-broncheal foreign body observed below 3 years of age was food material (seeds, beans). The hotdogs and peanuts are the most commonly aspirated foreign body in Western countries [2, 3, 6].

Choking is an emergency condition with high mortality if prompt measures are not being taken at the earliest [4]. In these cases the external resuscitative techniques may be useless, being unable to ventilate the lungs. Rigid bronchoscopy is primary maneuver to remove foreign bodies which is a specialized procedure requiring a skilled surgeon and a trained anesthetist. The availability of rigid bronchoscopy or the prompt removal of the foreign body is very crucial part to save life of patient as irreversible brain damage or death may occur even 5 - 10 minutes of mechanical obstruction. In present case there is delay before the rigid bronchoscopy was carried out due to unavailability at primary care hospital. The other important factors that determine the possibility of favorable outcome in choking cases are age of the affected person, level of consciousness, occurrence of crying, and characteristics of the foreign bodies [7].

Although, the definitive treatment was carried out in present case, a piece of groundnut embedded in left main bronchus at its origin was missed during rigid bronchoscopy procedure. The reason for non-visualization of groundnut piece might be due to angle of inclination of left bronchus to the trachea, accumulation of thick mucus around ground nut piece with mucosal oedema and non-suspicion as two pieces were removed. Concomitant mucosal edema, continued collection of secretion above the blockage leads to complete obstruction and resultant death. In view of unimproved hypoxia and worsening of patient's condition, the clinical diagnosis of post foreign body aspiration pneumonitis with bronchospasm was made. However, actual reason behind patient's condition and cause of death was detected on autopsy.

References

1. Polson CJ. *Suffocation. In: Polson CJ, Gee DJ, Knight B. editors. The Essentials of Forensic Medicine* 4th Edition, Oxford: Pergamon Press Ltd; 1985; p. 461.
2. Committee on Injury, Violence, and PoisonPrevention. Prevention of choking among children. Pediatrics. 2010 Mar; 125(3): 601-7.
3. AltmannAE, Ozanne-Smith J. Non-fatal asphyxiation and foreign body ingestion in children 0-14 years. InjPrev. 1997 Sept; 3: 176-82.
4. Sinha V, Chhaya V, Barot DS, Mehta K, Patel P, Patil S, Parmar V, Pashanth CD, Modi N, Patel R. Foreign body in tracheobronchial tree. Indian J Otolaryngol Head Neck Surg. 2010 Jun; 62(2): 168-70. doi: 10.1007/s12070-010-0044-2. Epub 2010 Sep 24.
5. Jaswal A, Jana U, Maiti PK.Tracheo-bronchialforeign bodies: a retrospective study and review of literature. Indian J Otolaryngol Head Neck Surg. 2014 Jan; 66(Suppl 1): 156-60. doi: 10.1007/s12070-011-0386-4. Epub 2011 Nov 30.
6. Goren S, Gurkan F, Tirasci Y, Kaya Z, Acar K. Foreign bodyasphyxiation in children. Indian Pediatr. 2005 Nov; 42(11): 1131-3.
7. Abder-Rahman HA. Infants choking following blind finger sweep. J Pediatr (Rio J). 2009 May-Jun; 85(3): 273-5.

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[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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