Original Article

UTILITY OF SPIRAL MULTISLICE CT SCAN IN ESTIMATION OF AGE FROM STERNUM: A PRELIMINARY STUDY

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UTILITY OF SPIRAL MULTISLICE CT SCAN IN ESTIMATION OF AGE FROM STERNUM: A PRELIMINARY STUDY

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Abstract:

Estimation of age is major forensic consideration and required in civil and criminal matters. Radiological examination of sternum especially fusion of sternal segments and fusion of xiphoid process with sternum offer considerable help. The present study is conducted with an aim to assess the utility of spiral multislice CT scan for assessment of fusion of xiphoid process with sternum to estimate age. The study includes 50 subjects consisting of 26 males and 24 females. The preliminary observations with use of spiral multislice CT scan were encouraging. The age group included in the study ranged from 25 years to 45 years. By the age of 40 years all women showed fused xiphoid with sternum whereas in the age group of 41 to 45 years about 71.42% men had complete fusion while 28.56% had partial fusion.

Key Words: age estimation, forensic, gross, X ray, CT scan

Introduction:

Estimation of age is major forensic consideration and required in civil and criminal matters. With the enactment of the Juvenile Justice Rules 2007 now many offenders are claiming that they were minor when the offence was committed. As per provision of section 12 [3 (b)] the medical opinion should be sought from a duly constituted Medical Board, which will declare the age of the juvenile or child. In case exact assessment of the age cannot be done, the Court or the Board or, as the case may be, the Committee, for the reasons to be recorded by them, may, if considered necessary, give benefit to the child or juvenile by considering his/her age on lower side within the margin of one year [1] . Under such circumstances and for this age group, it becomes difficult for Doctors to assess the age with reasonable degree of error. Radiological examination of sternum especially fusion of sternal segments and fusion of xiphoid process with sternum offer considerable help. However, traditional or digital X-rays have limitations like one have to take more than one views and there is always possibility of overlapping of the thoracic tissue shadow. Considering this limitation, the present study is conducted with an aim to assess the utility of spiral multislice CT scan for assessment of fusion of xiphoid process with sternum to estimate age.

Material and methods:

This is a prospective study conducted at Department of Radiodiagnosis Government medical College and Hospital Miraj between August 2012 and September 2013. The study includes 50 subjects and was arranged in four groups. Group A consisted of individual having age from 25 years to 30 years, Group B from 31 to 35 years, Group C from 36 to 40 and Group D from 41 years to 45 years. The fusion between xiphoid and sternum is visualised by utilizing spiral multislice CT machine (Somatom definition AS 128 slice CT by Siemens). The fusion is considered in three grades: Grade I - non fusion, Grade II – partial fusion and Grade III – complete fusion.

The study includes patients who were referred for thoracic CT examination for various clinical reasons. Patients were not exposed to unnecessary or excess radiation. Patient having thoracic skeletal deformity or having trauma were excluded from the study. A routine

thoracic CT protocol was followed and Axial plane images were obtained and were transferred to workstation for post processing. At workstation multi-planar reformatting (MPR) of the sagittal and coronal plane images were performed and three dimensional images of the sternum were obtained so that an anatomical details and ossification centre could be visualized in a better way.

Table 1: Age-wise distribution of cases and fusion status in males

Age group	No. of Subjects	Fusion of xiphoid with sternum		
		Grade I (%)	Grade II (%)	Grade III (%)
25 - 30	8	5 (62.5%)	3 (37.5%)	0
31 - 35	4	1 (25%)	1 (25%)	2 (50%)
36 - 40	7	1 (14.28%)	1 (14.28%)	5 (71.42%)
41 - 45	7	0	2 (28.56%)	5 (71.42%)
Total	26	7	7	12

Results: The present study includes 50 subjects consisting of 26 male and 24 female. The age group included in the study ranged from 25 years to 45 years. Table 1 and 2 shows the age group and fusion status in male and female subjects respectively. It was observed that in male group, fusion begins after 25 years of age but the fusion was not complete within 25 to 30 year. In the age of 41 to 45 years, 71.42% (n = 5) subjects have complete fusion between xiphoid and sternum while 28.56% (n = 2) showed partial fusion (fig 1). In female group it was noted that fusion begins after 25 years of age but the fusion was not complete in this age group. In the age group of 36 to 40 years, all cases showed complete fusion (fig 2).

Table 2: Age-wise distribution of cases and fusion status in females

Age group	No. of subjects	Fusion of xiphoid with sternum		
		Grade I (%)	Grade II (%)	Grade III (%)
25 - 30	8	7 (87.5%)	1 (12.5%)	0
31 - 35	4	1 (25%)	2 (50%)	1 (25%)
36 - 40	4	0	0	4 (100%)
41 - 45	8	0	2 (25%)	6 (75%)
Total	24	8	5	11

Discussion: Review of literature reveals few studies were conducted for assessing age from sternum. However, most of these studies were based on gross examination [2- 6]. In past few years X- ray examination was utilized for the study [7, 8]. In present study an attempt is made to utilize spiral multislice CT scan to know fusion of xiphoid with sternum. The advantages of such techniques are considerable like one can visualize the image in Bone-Window and Volume Render Technique (VRT) format; one can have 3 D view and therefore the image can be rotated. Thus the status between xiphoid and sternum can be visualised from all sides i.e. anteriorly, laterally and posteriorly. Since all work is done at work station we can preserve the image digitally, can retrieve at any time and can be transferred to anywhere if required.

The preliminary observations with use of spiral multislice CT scan were encouraging. Considering the fusion of xiphoid with sternum, in both genders the fusion begins after 25 years of age but it was not complete. By the age of 40 years all women showed fused xiphoid with sternum whereas in the age group of 41 to 45 years about 71.42% men had complete

fusion while 28.56% had partial fusion. Since the study had included subjects up to 45 years of age therefore the maximum age at which all subjects would show complete fusion is not known. Similarly in the age group of 36 to 40 years of age, about 14.28% of men showed non-fusion. Thus it can be considered that in women the fusion occurs at 40 years while in majority of men it occurs between 41 to 45 years of age.

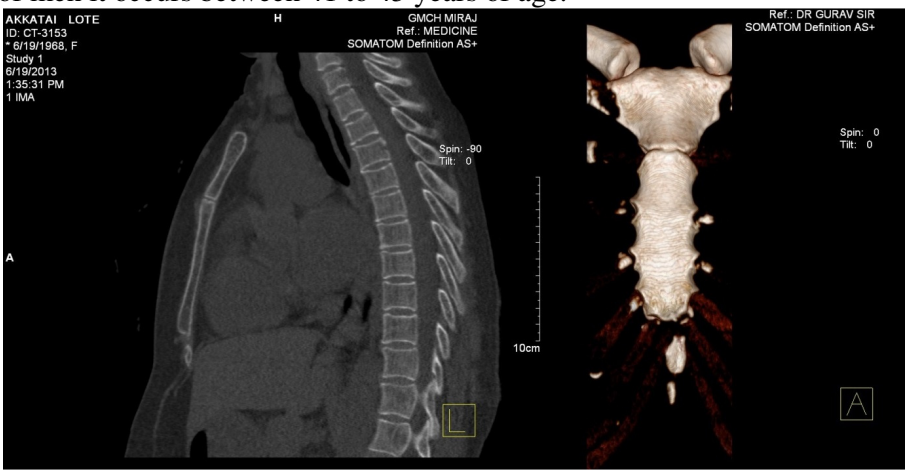

Fig 1: Bone window and Volume Rendering Technique (VRT) images showing non-fusion of xiphoid and sternum

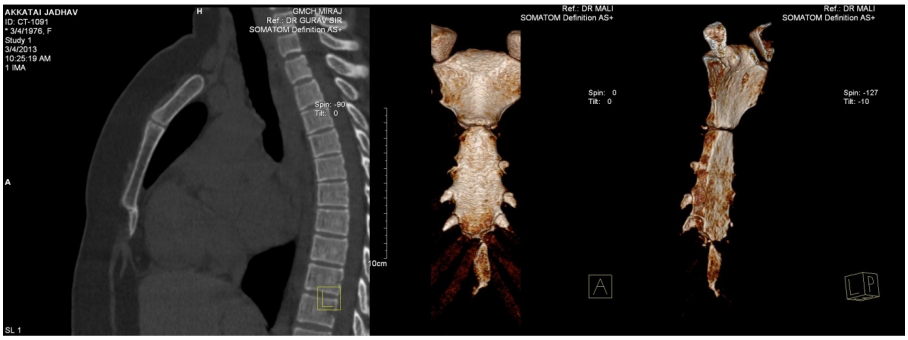

Fig 2: Bone window and Volume Rendering Technique (VRT) images showing partial fusion of xiphoid and sternum

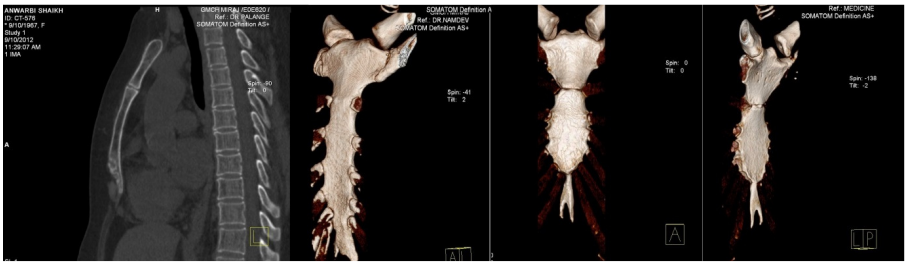

Fig 3: Bone window and Volume Rendering Technique (VRT) images showing fusion of xiphoid and sternum

The earlier well-known study is by Jit et al (1986). The authors had concluded that the xiphoid process did not fuse with the body of the sternum in males below 18 years and female below 21 years. Non-fusion of the xiphoid process was seen in 11.4 % of males who were above 66 years and 37.5 % female above 40 years [2]. As per study by Singh et al (1994)

commencement of fusion between sternum and xiphoid process started in the age group of 18-20 years in both sexes and complete fusion was seen in the age group of 21-25 years (6.45 % males, 2.22 % females). Incidence of complete fusion increased with advancing age reaching a maximum of 60 % in the age group more than 66 years in males and 26.08 % in females in age group 41-45 years. The authors concluded that the fusion of the sternum with the xiphoid process did not help in determining the age of a subject who is above 18-20 years of age [3]. Gautam et al (2003), in the age group of 41 to 45 years, had observed complete fusion in 40% of males and 33.3% of females [4]. Chandrakanth et al (2012) noted non-fusion of xiphoid with sternum below age of 30 years. Similarly they had observed non-fusion till the age of 48 years in males and 46 years in females and they concluded that there is variation in fusion and sternum alone is not reliable for estimation of age in South Indian population [5]. Garg et al (2011) had noted that in the age group of 41 to 45 years, complete fusion was shown in 47.62% of males and 50% of females [7]. The findings of Silajiya et al (2013) and Kaneriya et al (2013) are in accordance with present study [6, 8].

Considering the above studies there is apparent variation in fusion of xiphoid with sternum. The xiphi-sternal joint is a symphysis type of cartilaginous joint and it usually becomes a synostosis [9]. Occasionally the joint may remain unfused till the old age and therefore caution needs to be exercised while interpreting the data. However, most of the study points that by the age of 40 years majority of cases showed partial to complete fusion. The findings of present study also endorse the same view. Moreover, a study involving larger subjects and by utilizing present day radiological technique like spiral multislice CT scan may help to resolve the issue and thereafter a meaningful conclusion may be drawn.

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Original Article

TRENDS OF FATAL ROAD TRAFFIC ACCIDENTS IN CENTRAL INDIA

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Original Article

TRENDS OF FATAL ROAD TRAFFIC ACCIDENTS IN CENTRAL INDIA

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Abstract:

During a two year prospective study in central India, 224 autopsy cases of fatal road traffic accidents were studied. Young adult males between the age group of 21-40 years formed the majority (52.71%) of victims and peak incidence occurring between 6pm to 12 midnight (37.50%). Motorcyclists were the most common victims (47.76%) and heavy motor vehicles were the offending agents in most cases (48.21%). Multiple injuries were present in majority of the victims. Extremities suffered more surface injuries than any other body region. Motor vehicle occupants suffered more injuries to thoraco-abdominal region than motorcyclists or pedestrians. Injury to head was responsible for deaths in most cases with more than 50% victims dying in first 24 hours.

Keywords: fatal, road traffic accidents, multiple injuries, motorcyclists, heavy motor vehicles.

Introduction:

Problems related to crash injuries on the road and eventually to the death of the victim of the accident may call upon the entire spectrum of the forensic expertise. The forensic expert is entrusted with the assessment of the injuries, mechanism of injuries by which they have been induced, the cause of death, presence of disease if any and also the collection and preservation of blood, viscera and of trace evidences found on the body or on the clothing worn by the victim. The chemical analyser may be requested to establish whether intoxication by alcohol or drugs was a factor in causing the accident and evaluation of trace evidences. The mechanical expert may be asked to examine the vehicles for any possible non-functioning part (light, brakes, and steering wheel), condition of the road and circumstances that might have played a role in the accident.

Material and Methods:

The present study was carried out in our department of forensic medicine and toxicology from January 2011 to September 2012. The material in the present study included all cases of road traffic accidents brought for medico-legal post-mortem examination. Cases satisfying the following definition of RTA and RTC were selected: RTA - A collision involving at least one vehicle in motion on a public road that results in at least one person being injured or killed. RTC - A collision or incident that may or may not lead to injury, occurring on a public road and involving at least one moving vehicle.

In all these cases detailed personal information was recorded from relatives and or accompanies of victim, police inquest papers, and hospital records. The history as regards the circumstances of the accidents and other relevant data about injuries to the victims, the site of impact was obtained from police inquest papers. Dead bodies were examined in detail during post-mortem for the presence of external injuries, internal injuries including bone and joints and finally characteristics and distribution of injuries were analysed.

All cases were thoroughly studied considering parameters like age and sex distribution, time and manner of accident, profile of victims, offending vehicles, survival period of victims, nature, type, area of the body injured, fatal injuries and cause of death. A pretested proforma was used for this purpose to extract information.

Results:

Out of 224 cases in the present study, maximum incidence of accident was in the age group of 21-30 years comprising 76 (33.92%) cases, followed by 41-50 years (19.19%).

Table 1: Age wise distribution of victims of different road users.

Age	Pedestrian	Bicycle	Motor Cycle	Three Wheeler	Four Wheeler	Total
01-10	1	0	1	1	0	3 (1.33%)
11-20	1	5	11	1	5	23(10.26%)
21-30	7	1	45	3	20	76(33.92%)
31-40	9	1	20	0	5	35(15.62%)
41-50	11	8	16	0	8	43(19.19%)
51-60	12	4	12	0	6	34(15.17%)
Above 60	5	2	2	1	0	10(4.46%)
Total	46 (20.53%)	21 (9.37%)	107 (47.76%)	6 (2.67%)	44 (19.64%)	224 (100%)

Among all the road users, motorcyclists formed the majority of victims involving 107(47.76%) cases, followed by pedestrians 46(20.53%) cases and four wheelers 44(19.64%) cases. In 44 four wheeler cases, 24 were using light motor vehicles like car, jeep, vans, etc and rest 20 were using heavy motor vehicles like truck, tempo, bus, tractor, etc.

Sex wise distribution of victims showed that 184(78.26%) victims of the total were males and remaining 40(21.74%) was females. Male to female ratio was 4.6:1.

In the present study, majority of the incidents, occurred between 1800 to 0000 hours, comprising 84(37.50%) of total cases. Of the 84 cases occurring between 1800 to 0000 hours, 42(50%) occurred during the first two hours.

It was observed that 89(39.73%) victims died on the spot of accident or on their way to the hospital. After hospitalization majority of victims 83(37.04%) died within first 24 hours. Thus 76.77% of the victims died within first 24 hours of accident.

Collision (C) between two moving vehicles (HMV,LMV, Motorcycles, Bicycle) was the commonest manner of accident involving 122(54.46%) cases, followed by dash (D) of a vehicle to pedestrians in 46(20.53%) and to static objects like divider, electric pole, tree, vehicle etc in 16(7.14%) cases. Among motorcyclists skidding (S) was seen in 19(8.48%) cases. In 11(4.91%) cases, tumbling (T) of vehicle was the manner of accident. In 10(4.46%) cases, victims fell (F) down from the moving vehicle.

Table 2: Victim profile and manner of accident.

Victim profile	Types of offending vehicle						
	HMV	LMV	Two wheelers	Three wheelers	Unknown	Others	Total
Pedestrians	15D	3D	5D	3D	20D	NA	46
Motor-cyclists	33C	11C	9C	1C	19C	34 (19S+8D+7F)	107
Bicyclists	11C	2C	2C	1C	2C	3F	21
LMV users	12C	4C	0	0	2C	6(4T+2D)	24
HMV users	9C	0C	0	0	0	11(6T+5D)	20
Three wheeler	1C	1C	2C	0	0	2(1T+1D)	6
Total	81	21	18	5	43	56	224

Head-on collision was reported and observed in majority (59.83%) of cases, followed by head to tail collision in 14(11.47%) cases, head to side in 8(6.55%) cases and side to side in 4(3.27%) cases. In 23 (18.85%) cases the type of collision was not known.

Head injury was the most common cause of death comprising of 98(43.75%) cases, followed by Injury to vital organs 43(19.19%), Hemorrhage and shock 33(14.73%), Blunt trauma chest 17(7.58%) and Spine injury 16(7.14%). In 10(4.46%) hospitalized cases the cause of death was Septicemia due to injuries sustained. In only 1 case, an occupant of a truck died due to drowning as a result of tumbling of his vehicle into a river.

Table 3: Causes of death

Cause of death	Total	%
Head injury	98	43.75
Spine injury	16	7.14
Blunt trauma chest	17	7.58
Blunt trauma abdomen	6	2.67
Haemorrhage and shock	33	14.73
Injury to vital organs	43	19.19
Septicemia	10	4.46
Drowning	1	0.44
Total	224	100

External injuries in the form of abrasions, contusions, lacerations and fractures were observed mostly on the extremities 204(91.07%) cases, head neck and face in 193(86.16%) cases, back in 88(39.28%) cases, chest in 78(34.82%) cases, abdomen in 66(29.46%) cases and pelvis in 24(10.71%) cases.

Pattern of head injury: Scalp injury in the form of contusions, lacerations was the commonest type of injury seen in 158(70.53%) cases, followed by intracranial hemorrhages 130(58.03%) and skull fractures 102(45.53%). Skull vault fracture was present in 91(40.62%) cases. Considering single region, parietal region was most commonly involved 83(23.71%), followed by frontal region 60(17.14%) and temporal region 56(16%). Linear fracture of skull was the commonest seen in 83(49.40%) cases, followed by comminuted fracture 48(30.67%) and depressed fracture in 34(20.23%) cases whereas sutural fracture was seen in 3 cases. Base of the skull was fractured in 58 (25.89%) cases. Considering solitary fossa, anterior cranial fossa was fractured in majority of cases 48(13.17%), followed by middle cranial fossa 36(10.28%) and posterior cranial fossa in 28(8%) cases.

Out of 224 cases intracranial hemorrhage was seen in 130 cases of road traffic accidents. In majority 64(49.23%) of cases a combination of subdural hemorrhage and subarachnoid hemorrhage was seen, followed by only subarachnoid hemorrhage in 31(23.84%) cases and only subdural hemorrhage in 23(17.69%) cases. Thus, subarachnoid haemorrhage was the most commonly observed intracranial hemorrhage 103(45.98%) cases, followed by subdural haemorrhage 97(43.30%) and extradural hemorrhage 12(5.35%). Injury to brain in the form of contusion and laceration was found in 100(44.64%) cases; contusion of brain was present in 51 cases, laceration in 16 cases and a combination of contusion and laceration in 33 cases.

Pattern of thoracic injuries: In the present study, ribs were fractured in 82(40.59%) cases, followed by lung injury in 66(32.67%) cases. Heart was injured in 16(7.92%) cases.Fracture of ribs were observed in 82 cases out of which associated lung injury was seen in 61cases and combination of injury to ribs, lungs and heart was seen in 12 cases. In 44(19.64%) cases thoracic injuries were associated with abdominal injuries.Amongst all the motorcyclist (107) victims, ribs and lungs were injured in 33(30.84%) and 25(23.36%) cases respectively, whereas in all (44) victims of four wheeler, ribs and lungs were injured in 25(56.81%) and 23(52.27%) cases respectively.

Pattern of abdominal injuries: Abdominal organs were injured in 68(30.35%) cases in the present study. Amongst the fatal cases of road traffic accident with abdominal injuries, liver was the most commonly injured solitary organ seen in 25(36.76%) cases, followed by injury to liver and spleen in 16(23.52%) and injury to only spleen in 8(11.76%) cases. Considering

all 224 cases of our study, liver was the most commonly injured organ in 51(22.76%) victims followed by injury to spleen in 30(13.39%) victims.
Amongst all the motorcyclist (107) victims, abdominal organs were injured in only 26(24.30%) cases, whereas in all (44) victims of four wheeler, abdominal organs were injured in 20(45.45%) and in all (46) cases of pedestrians, abdominal organs were injured in 11(23.91%) cases.

Discussion:

The distribution of road traffic injuries in fact varies dramatically across countries or world regions, not only in terms of age or sex groupings but also in terms of road user groups and risk factors (such as speeding, alcohol-impaired driving, and not using protective devices like helmet or seatbelt). Appropriate response to disparities in types of road traffic injuries is necessary, if this major global health problem is to be comprehensively addressed.

In present study, majority of the victims (33.92%) belonged to the **age group** 21-30 years. Similar observations in Indian studies were noted by other authors [1,2,3]. As far as this age (21-40 years) group is considered, it is the most active phase of life, physically and socially. People in this age group are constantly mobile for work, education or recreational activities, using private or public transport for the same. Also there is tendency of this age group to show scarce attention to traffic rules & regulations and hence more prone to accidents.

We observed maximum road traffic fatalities in motorcyclists (47.76%), other researchers [4,5,6] too observed more fatalities among motorcyclists. Among all motor vehicles, motorcycles are prone for accidents as they are unstable and tumble even on slight impact. Motorcyclists are prone to injuries as they are not enclosed, leaving the riders /pillions vulnerable to contact with road surfaces.

A preponderance of male victims over females with a male: female ratio of 4.6:1 was observed in the present study. Similar findings were also observed by [5,7,8]. Higher male incidence in India can be explained by the fact that they are the working class, lead a more active life and keep themselves outdoors for most of the time. Also most of the vehicles in India are driven by males. On the contrary, females mostly keep themselves indoors doing household works.

Heavy motor vehicles like truck, bus, tempo, tanker, tractor etc were the most common offending vehicle involved in 81(48.21%) cases in our region. Our observation is in agreement with [1,9]. Impact with heavy vehicles usually has a fatal outcome due to their greater mass and velocity. The lack of discipline and traffic sense due to low education level amongst such drivers is responsible for their rash driving. Also at times they have to drive for long hours which make them tired and hence there is increase in errors made by them.
Majority of the incidents, occurred between 1800 to 0000 hours, comprising 84(37.50%) of total cases. Similarly [1,10] noted maximum incidents during evening time. In the present study maximum incidences of accidents occurring during 18:00 hours to 00:00 hours could be due to working schedule in this part; people usually come back from work being tired with the whole day's work. Also people are in a hurry to come back home and the traffic is at peak during evening hours.

In the present study, 76.77% of the victims died within first 24 hours of accident. In accordance with our observation [9,7,10] reported maximum deaths in first 24 hours. The high incidence of deaths of victims before reaching the hospital can be attributed to the large extent of injuries, lack of effective ambulatory services and emergency units which could provide much needed first aid to the victims before reaching hospital.

Regarding the manner of accident and type of collision, we found that collision between two moving vehicles was the commonest manner of accident seen in 122(54.46%) cases, followed by dash of a vehicle to pedestrians in 46(20.53%) and to static objects like divider, electric pole, tree, vehicle etc in 16(7.14%) cases. In 11(4.91%) cases, tumbling of vehicle was the manner of accident. In 10(4.46%) cases, victims fell down from the moving vehicle. Similar observations were noted by [11,12,13]

Considering the cause of death in various road users, Head injury was the most common cause of death comprising of 98(43.75%) cases. Head injury as the cause of death in majority of cases was also observed in studies done by [1,14,15].

Extremities suffered maximum injuries 591(40.56%), followed by head, neck and face region 433(29.71%). Presence of maximum surface injuries over the extremities in our study can be due to the fact that limbs have a larger surface area and are often the first point of contact either with the offending vehicle or the surface/road.

In the present study skull fracture was observed in 45.53% of total cases. Similar finding was observed by other authors [1,16,17]. Fracture of skull vault (68%) was more commonly observed in the present study and is in accordance with studies of [2,7,9,14,16,]. Parietal bone was found fractured in majority (23.71%) of cases in our study. Similar observations were made by [2,3,16].However, Temporal bone fracture was noted in majority of cases in studies done [9,10,14] whereas Honnungar et al[18] noted frontal bone fracture in maximum cases which is in contrast with our study. In the present study linear/fissure fracture was noted in maximum (49.40%) cases. Similar observations were made by [2,3,14].

Among intracranial hemorrhages we noted a combination of subdural and subarachnoid in maximum (49.23%) cases which is in accordance with observations made by [6,19]. Considering total cases in the present study, subarachnoid haemorrhage was the most commonly observed intracranial hemorrhage 104(48.59% cases), which coincides with the observation of [9]. Contradictory to our finding, subdural hemorrhage was observed most commonly by [1,2,3,7]. Injury to brain was observed in 44.64% cases in the present study which is in agreement with [6,15,17].

In the present study it was observed that ribs were fractured in 82(40.59%) cases. Amongst all the motorcyclist 107 victims, ribs and lungs were injured in 33(30.84%) and 25(23.36%) cases respectively, whereas in all 44 victims of four wheeler accidents, ribs and lungs were injured in 25(56.81%) and 23(52.27%) cases respectively. In accordance with our observations, [9,18,20] observed that fracture of the ribs was the commonest chest injury.

Abdominal organs were injured in 68(30.35%) cases in the present study. Liver was the most commonly injured organ in 51(22.76%) victims followed by injury to spleen 30(13.39%). Amongst all the motorcyclist 107 victims, abdominal organs were injured in only 26(24.30%) cases, whereas in all 44 victims of four wheeler accidents, abdominal organs were injured in 20(45.45%). Similarly liver laceration was the commonest abdominal injury noted by [9,16,18] observed that laceration of the liver was commonly seen abdominal injury. However, in a study on pattern of thoraco-abdominal injuries by Shetty et al[20] Kidney was the most commonly involved abdominal organ followed by the liver. In another study by Govekar et al[8], most commonly injured abdominal organ noted was spleen.

Conclusion:

In the present study, involvement of young adult males to such a high extent, suggests the heavy loss of valuable man-power and human resources due to mortality and morbidity. Presence of multiple injuries in our study is in accordance with the fact that multiple injuries are a rule in road traffic accidents. The study highlights the need of compulsory implementation of helmet wearing for motorcyclist and seat belt use for four wheeler

occupants and necessitates the need for taking urgent steps for establishing ambulance services and provision of pre-hospital care & trauma services to reduce mortality and morbidity. Use of heavy vehicles should be barred from the busy streets during evening hours and speed limits be enforced on them. Furthermore, law agencies needs to implement the traffic rules very strictly.

Recommendations:

Owing to the enormous impact of road traffic accidents on health and economy in our country, a multidimensional approach is suggested to minimise such incidents. They include:

1. Imparting road safety education to all persons with special emphasis on educating young persons. School children can be taught about the use of sidewalks, road crossing techniques, traffic signals, reaction time, braking distance and hazards of alcoholic drinks.
2. Issuing licenses by using comprehensive and scientifically based testing of driving skills, medical fitness "and periodic review of driving skills especially annual medical examination of drivers above 50 years of age.
3. At the time of giving license to the public transport drivers (Bus and Trucks), they can be given training in first-aid skills so that victims are attended immediately in the post accident period.
4. Speed limits should be strictly implemented near populated areas, residential areas and schools.
5. Maintaining existing roads, improving road surface, removing obstacles, constructing guards, rails, proper signs and widening or narrow sections of roads, zebra crossings for pedestrians at appropriate traffic points, building flyovers and subways wherever required to reduce traffic congestion.
6. The vehicles should be properly checked with regard to their maintenance, brakes and tyres and improving vehicle designs to minimise damage in event of a crash.
7. Citizens should change their attitudes positively, stop reckless driving, obey traffic rules, prohibit use of mobile phones while driving, and use of protective devices like helmet for two wheelers and safety seat belts in four wheelers. Attempts should be made to reduce travel and if travel is necessary public transport system should be used.
8. Trauma centres should be modernized and fully equipped with emergency drugs and surgical instruments along with adequate manpower.
9. Help line and support centres should be established in coordination with emergency response teams to prevent death/morbidity.
10. Government authorities should enforce traffic rules strictly. Breath analysers must be used regularly for testing drunken drivers and those found positive must be heftily fined with cancellation of license in cases of repetitive offence.
11. Partnerships need to be formed with public, private and non-governmental organizations to address more visibly the problems and press harder for improvements.

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Original Article

EFFECT OF GRADED HEAD UP TILT ON CARDIOVASCULAR AND PARASYMPATHETIC RESPONSES IN NORMOTENSIVE INDIVIDUALS

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Original Article

EFFECT OF GRADED HEAD UP TILT ON CARDIOVASCULAR AND PARASYMPATHETIC RESPONSES IN NORMOTENSIVE INDIVIDUALS

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Abstract:

The present study was carried out with objectives to study the effect of graded head up tilt (30^0 and 60^0) on cardiovascular and parasympathetic responses in normotensive and to study the correlation between recorded cardiovascular and parasympathetic responses at both angles of head up tilt. In 100 healthy normotensive subjects effect of graded head up tilt on cardiovascular and parasympathetic responses were studied. Cardiovascular and parasympathetic parameters were studied in supine position and at both angles of head up tilt.

From this study it is concluded that, head up tilt cause more significant effect on cardiovascular parameters as compared to parasympathetic responses. Cardiovascular parameters are more affected at 60^0 head up tilt, indicating increased sympathetic activity with low level tilts and an interaction between increasing sympathetic activity and decreasing parasympathetic activity at high level tilts.

Keywords: Normotensive, head up tilt, cardiovascular, parasympathetic

Introduction:

Change in the posture poses a greater challenge in maintaining normalcy of cardiovascular functions. Especially lots of variations are observed in haemodynamic parameters, such as blood pressure, heart rate etc. during change of posture. However, autonomic regulation plays important role in regulating blood pressure in various day today activities. Failure of autonomic function (i.e. baroreflex sensitivity) develops orthostatic hypotension, as observed in some of the individuals in orthostatic posture due to failure of regulatory mechanisms.

Changing posture from supine to motionless standing results into displacement of blood volume into dependent capacitance vessels and also cause transudation of plasma fluid across dependent capillaries (1).This upright posture causes pooling of blood in lower extremities, reduction of venous return, and decreased stroke volume and cardiac output (2, 3).

In most of the people, due to redistribution of blood volume, decrease in blood pressure occurring is very slight and disappears due to sequential activation of responses which maintain normal blood pressure rapidly. One of the major response among these is baroreflex (4), in which stretch receptors in the carotid artery in the neck, and major vessels, structures in the thorax, are activated due to decrease in arterial pressure and central volume cause a coordinated increase in sympathetic nervous activity and decrease in parasympathetic nervous activity and modulation in hormonal activity.

During orthostasis it is observed that, amongst cardiovascular responses arterial pressure is not affected significantly mainly due to rapid baroreflex-mediated increase in heart rate (HR) and sympathetic vasoconstrictor nerve activity (5,6), resulting in increased total peripheral resistance via norepinephrine (NE) secretion (7, 3). These well-synchronized cardiovascular events prevent major abrupt changes in arterial pressure and the development of symptoms (e.g. hypotension, syncope) during orthostatic stress.

Hence present study was planned to study the effect of graded head up tilt on cardiovascular and parasympathetic responses in normotensive individuals. It is hypothesized that, orthostatic stress will produce excessive sympathetic reactivity and withdrawal of parasympathetic reactivity in normotensive individuals.

The objectives of study were:

1. To study the effect of graded head up tilt (30^0 and 60^0) on cardiovascular and parsympathetic responses in normotensive.
2. To study the correlation between recorded cardiovascular and parasympathetic responses at both angles of head up tilt.

Materials and Methods:

This study was conducted in the department of Physiology at Rural Medical College, Pravara Institute of Medical Sciences, Loni, Dist: Ahmednagar – 413 736 (MS) and was approved by Institute Ethical Committee. The male subjects selected for the study were between age group of 20-70 years (average age 34.82 ± 10.51, n=100). Subjects were selected and included in the study from clerical, teaching staff and students of our institute, who fulfilled following criteria:

- No signs of cardiac, vascular or neurological involvement
- No history of diabetes mellitus, hypertension
- No history of drug treatment
- No history of systemic illness

Their normal blood pressure status was considered according to guidelines of, Seventh Report of the Joint National Committee (JNC7) on Prevention, Detection, Evaluation and Treatment of high blood pressure and Indian Hypertension Guidelines II, 2007 with optimal value as <120/<80 mmHg (8,9).

All subjects were called with appointment in the laboratory, 2 hours after light brake fast in the morning (09.00am-12.00pm).Subjects were instructed not to consume caffeinated beverage and to avoid smoking before 12 hours of the test. Subjects were informed in detail about study protocol and written consent was obtained before the study.

Before beginning of the test, anthropometric characteristics such as height (aveage height 163.32 ± 8.31 cm), weight (average age 55.54 ± 9.652Kg), body mass index (average BMI,20.82 ± 3.386 Kg/m^2) were recorded in all subjects.

Cardiovascular Parameters:

Subjects were made to lie comfortably on tilt table (Reliable Surgicals, Sangamner) for 20 minutes in the supine position. Three straps were applied at the level of knee, waist and head. After 20 minutes of rest baseline cardiovascular parameters such as systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse pressure (PP), mean arterial blood pressure (MAP=DBP+1/3 PP), heart rate/minute (HR/MIN), rate pressure product (RPP), were recorded at 1, 5, 10 minutes of interval by using digital blood pressure apparatus (Digicheck, Japan).

Thereafter subjects underwent gradual head up tilt at 30^0, 60^0 angles of tilt at the speed of 5^0/sec. During head up tilt maneuver passive head up tilt protocol was followed only for 10 minutes. Tilt table with foot board was used in the study to support body weight. The following sequence of recording was followed.

1. Basal: 20 minutes of rest on tilt table in supine position
2. After 30^0 HUT
3. After 60^0 HUT

Cardiac parameters were recorded immediately after 1, 5, 10 minutes of HUT. Between each HUT the subject was tilted back to horizontal position and allowed to rest for 10 minutes.

Parasympathetic Parameters:

Similarly parasympathetic tests were performed during supine and at 30^0 and 60^0 head up tilt position. Following parasympathetic tests were performed serially by using CANWin instrument (Windows based Cardiac Autonomic Neuropathy Analyser, Genesis Medical Systems PVT. LTD, Hyderabad). These tests were mainly selected since they are commonly used to assess parasympathetic activity.

i. Heart rate response to standing/orthostatic (30:15 ratio)
   The ratio of the 30^{th} to the 15^{th} RR interval duration on an electrocardiogram (30:15 ratio) immediately after active standing from the supine position has been used as one of the markers of baroreflex function.
   This test is also used in different conditions during head up tilt studies (10,11). In this study 30:15 ratio was determined as longest RR interval around 30^{th} beat to minimum RR interval around 15^{th} beat in the supine position and at different angles of head up tilt.
ii. Valsalva maneuver
   In standard Valsalva maneuver, the supine patient is connected to an ECG monitor and forcibly exhales for 15 seconds against fixed resistance (40mmHg,) with closed glottis. Often patient blows into a tube connected to a gauge moving the gauge's needle of mercury column to 40 mmHg for 10-15 seconds. The response to Valsalva maneuver records four phases (phase I, II, III & IV) in healthy individuals.
   In Valsalva maneuver , Valsalva ratio (VR) is determined from the ECG tracing by calculating the ratio of the longest RR-interval after the maneuver (Phase IV, reflecting bradycardia response to blood pressure overshoot) to the shortest RR – interval during or shortly after the maneuver (Phase II, reflecting tachycardia as a result of strain).
   In present study Valsalva maneuver was performed in supine position (12,13), since, as reported, in healthy adults, autonomic balance does not change significantly with different recumbent postures (13,14), but is clearly different between supine and vertical postures (standing or sitting). After conducting Valsalva maneuver in supine position it was recorded at 30^0,60^0 head up tilt position.
iii. Heart rate response to deep breathing test (E:I ratio):
   This test approaches the optimal test for cardiovagal function. Both afferent and efferent pathways involved are vagal (15).
   The subjects were instructed to take deep breathes at the rate of six breathes/minute (i.e., one breathe per 10 second) while being monitored by ECG. From recorded ECG E:I ratio was calculated. E: I (Expiration to Inspiration) is the ratio of the longest RR – interval during deep expiration to the shortest RR – interval during deep inspiration (16,17,18).This test was conducted in all subjects in supine position and at 30^0,60^0 head up tilt.

Statistical Analysis:

For each parameter recorded-mean and standard deviations (SD) were calculated. To find any significant change the data was analyzed by applying Student t –test. The P values less than 0.05 ($P<0.05$) were considered as statistically significant.

Results:

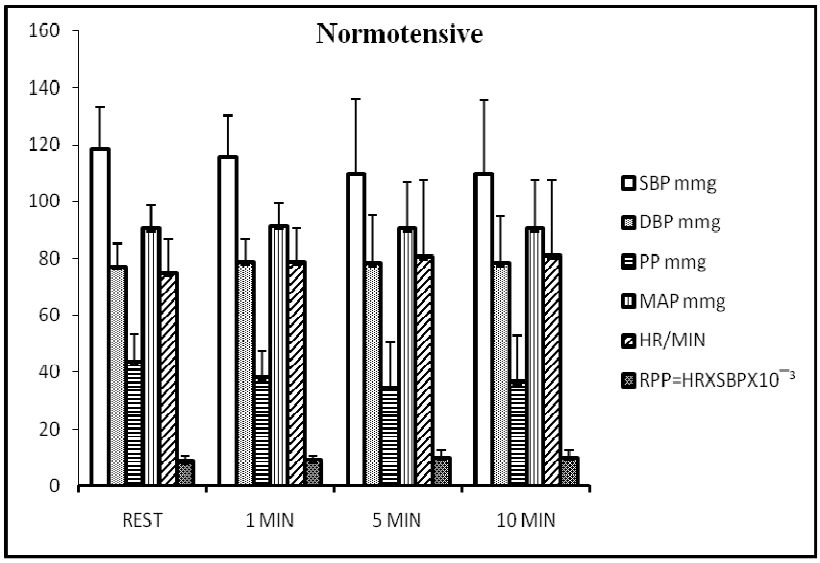
Table 1, 2 and 3 show results of cardiovascular (Table: 1, 2) and parasympathetic responses recorded in supine and at selected head up tilt positions and results are presented graphically (Fig: 1 - 3).

Table 1: Effect of 30^0 head up tilt on cardiovascular parameters in normotensive

Parameter	Basal	1 Min	5 Min	10 Min
SBP	118.51 ± 18.45	115.52 ± 14.77	119.10 ± 12.36	117.96 ± 11.13
DBP	77.01 ± 8.36	78.59 ± 8.38*	79.61 ± 9.72**	78.92 ± 9.41*
PP	43.79 ± 9.33	38.06 ± 9.47***	39.32 ± 10.63***	39.11 ± 10.63***
MAP	90.48 ± 11.72	91.26 ± 8.06	92.04 ± 12.29	91.06 ± 9.92
HR/MIN	74.56 ± 10.88	78.51 ± 12.15***	79.70 ± 12.67***	79.67 ± 11.81***
RPP	8.87 ± 1.76	9.08 ± 1.74	9.52 ±2.01***	9.42 ± 1.61***

Values are Mean ± SD Pressure values are in mmHg. Basal values are before tilt. SBP: systolic blood pressure, DBP: diastolic blood pressure, PP: pulse pressure , MAP: mean arterial blood pressure, HR/MIN: heart rate/min, RPP: rate pressure product (Paired t–test: *P<0.05significant, **P<0.01 highly significant, ***P<0.001 very highly significant)

Fig 1: Cardiovascular parameters in normotensive at rest and at 30^0 HUT at different time interval.



Cardiovascular Parameters:

30^0 head up tilt (Table 1.Fig:1) recorded non-significant decrease in systolic blood pressure (SBP) after 1 and 10 minutes of head up tilt as compared with value recorded in supine position. However after 5 minutes of head up tilt SBP recorded non-significant increase in SBP.

Diastolic blood pressure (DBP) recorded significant increase in its value as compare to basal value recorded in supine position after 1minute (P<0.05), 5 minutes (P<0.01) and 10 minutes (P<0.05) of head up tilt.

Pulse pressure (PP) also recorded significant (P<0.001) decrease throughout the total duration of head up tilt as compared with basal value recorded in supine position.

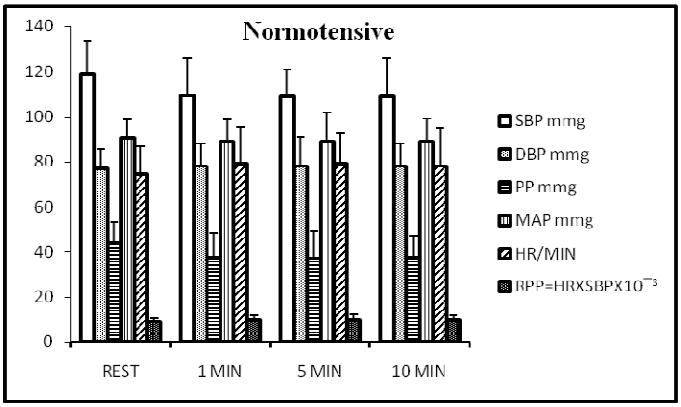
Mean arterial blood pressure (MAP) recorded non-significant marginal increase after 1 minute, 5 minutes and 10 minutes of head up tilt as compared with basal value recorded in supine position. Heart rate per minute (HR/MIN) recorded gradual significant (P<0.001) increase after 1 minute, 5 minutes and 10 minutes of head up tilt as compared with basal value recorded in supine position. Rate pressure product (RPP) recorded gradual increase in its value after 1 minute of head up tilt, however this increase was significant (P<0.001) after 5 minutes and 10 minutes of head up tilt as compared with basal value recorded in supine position.

Table 2: Effect of 60^0 head up tilt on cardiovascular parameters in normotensive

Parameter	Basal	1 Min	5 Min	10 Min
SBP	118.51 ± 18.45	114.76 ± 16.92	119.33 ± 12.28	115.03 ± 17.15
DBP	77.01 ± 8.36	79.64 ± 9.60**	81.49 ± 13.00***	80.41 ± 9.71 ***†
PP	43.79 ± 9.33	36.13 ± 11.30***	37.24 ± 11.97***	35.93 ± 10.08 ***††
MAP	90.48 ± 11.72	91.72 ± 9.81	93.51 ± 13.25	92.59 ± 10.24
HR/MIN	74.56 ± 10.88	88.70 ± 16.02***	90.34 ± 13.73***	90.46 ± 16.63 ***†††
RPP	8.87 ± 1.76	10.30 ± 2.06 ***†††	10.73 ± 2.47 ***†††	10.47 ± 2.16 ***†††

Values are Mean ± SD. Pressure values are in mmHg. Basal values are before tilt. SBP: systolic blood pressure, DBP: diastolic blood pressure, PP: pulse pressure ,MAP: mean arterial blood pressure, HR/MIN: heart rate/min, RPP: rate pressure product (Paired t –test: *P<0.05significant, **P<0.01 highly significant ***P<0.001 very highly significant, Comparison between 30^0 and 60^0 head up tilt : †P<0.05significant, ††P<0.01 highly significant †††P<0.001 very highly significant, unpaired t test: †P<0.05 significant, ††P<0.01 highly significant †††<0.001 very highly significant)

Fig 2: Cardiovascular parameters in normotensive at rest & at 60^0 HUT at different time interval



At 60^0 head up tilt (Table:2, Fig:2) recorded non-significant decrease in systolic blood pressure (SBP) after 1 and 10 minutes of head up tilt as compared with value recorded in supine position. However after 5 minutes of head up tilt SBP recorded non-significant increase in SBP.

Diastolic blood pressure (DBP) recorded significant increase in its value as compared to basal value recorded in supine position after 1minute (P<0.01), 5 minutes (P<0.001) and 10 minutes (P<0.001) of head up tilt. This increase was more significant (P<0.001) after 10 minutes of head up tilt as compared with 30^0 head up tilt.

Pulse pressure (PP) also recorded significant decrease (P<0.001) in its value after 1 minute, 5 minutes and 10 minutes of head up tilt as compared with basal value recorded in supine position. However this increases more significant (P<0.001) as compared with 30^0 head up tilt.

Mean arterial blood pressure (MAP) recorded non-significant marginal increase after 1 minute, 5 minutes and 10 minutes of head up tilt as compared with basal value recorded in supine position.

Heart rate per minute (HR/MIN) also recorded significant (P<0.001) increase after 1 minute, 5 minutes and 10 minutes of head up tilt as compared with basal value recorded in supine position.

Rate pressure product (RPP) recorded significant (P<0.001) increase in its value after 1 minute, 5 minutes and 10 minutes of head up tilt as compared with basal value recorded in supine position. This increase was significantly higher as compared with 30^0 head up tilt.

Except SBP, rest of the cardiovascular parameters (i.e. DBP, PP, MAP, HR/MIN, RPP) recorded significant effect of 60^0 head up tilt.

Parasympathetic Parameters:

Table 3: Effect of head up tilt on parasympathetic responses

SN	Parameter	Degree of head up tilt		
		0^0 (supine)	**30^0**	**60^0**
1.	**30:15 ratio**	0.99 ± 0.15	1.00 ± 0.18	1.01 ± 0.14
2.	**Valsava ratio**	2.32 ± 1.42	2.23 ± 1.50	2.38 ± 1.52
3.	**E:I ratio**	1.54 ± 0.97	1.50 ± 1.04	1.47 ± 1.16
Values are Mean ± SD				

Heart rate response to standing (30:15) recorded non-significant increase in its value at 30^0 and 60^0 of head up tilt as compared with basal value recorded in supine position, however the recorded values were less than normal ratio.

Valsalva maneuver was performed in supine position and as well as at 30^0 and 60^0 of head up tilt. Valsalva ratio recorded higher values (normal: $\geq$ 1.20) in supine position and at 30^0 and 60^0 of head up tilt. This increase was non-significant at 30^0 and 60^0 of head up tilt as compared with basal value recorded in supine position.

Similarly deep breathing test was performed to record E:I ratio (normal :$\geq$1.20). E:I ratio recorded higher values in supine position and at 30^0 and 60^0 of head up tilt. This increase was non-significant at 30^0 and 60^0 of head up tilt as compared with basal value recorded in supine position.

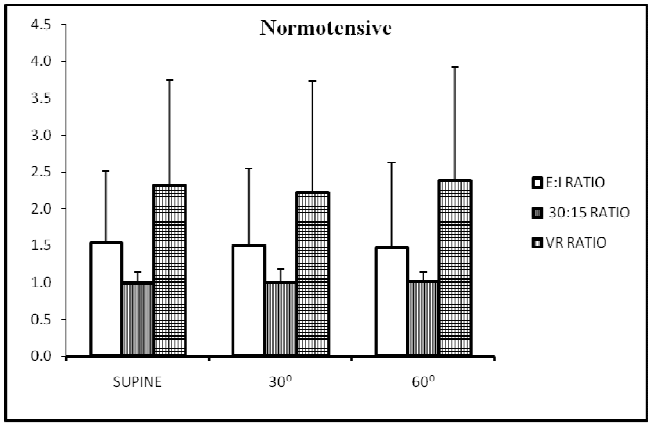
Especially parasympathetic parameters such as Valsalva maneuver and deep breathing test were not significantly affected on head up tilt.

Discussion:

SBP, PP parameters recorded decrease in its value at both angles of head up tilt, while DBP, MAP, HR/MIN, RPP increased gradually as the angle of HUT increased. At 30^0 HUT changes recorded in PP, HR/MIN, RPP were significant.

Similarly same pattern of decrease in SBP, PP was observed in normotensive at 60^0 HUT and significant change in DBP, MAP, HR/MIN, RPP was observed. These findings of our study agree with the study conducted by Vijayalaxmi et al (19).

Fig 3: Effect of 30^0 and 60^0 HUT on various parasympathetic responses



It is important to note that, autonomic functions vary with ageing (20) and parasympathetic (21) function is also reduced, since our subjects were selected from different age group (20-70 years).

In normotensive subjects, significant fluctuations were not observed, since, during initial phase of HUT intact autonomic activity (22) stabilized the cardiovascular parameters during total duration of HUT.

MAP is dependent on heart rate (HR), stroke volume (SV) and total peripheral resistance (TPR), which can be correlated as MAP=HR X SVX TPR. During HUT, changes like pooling of blood in lower parts of the body and low carotid pressure in the carotid sinus occur (23).

These gravity induced changes produced, cause decrease in venous return, stroke volume, pulse pressure, mean arterial pressure which cause tachycardia and vasoconstriction, due to baroreceptor reflex (24). In this upright posture increase in heart rate and peripheral resistance regulate blood pressure. This mechanism is more effective in young individuals than older ones in maintaining blood pressure in upright posture (25).This was the major factor to cause decrease in SBP and PP during HUT.

Increase in HR, as reported by other studies (26,27,28) is tilt dependent, which remained elevated throughout the period of HUT. Some studies have reported that, head up tilt cause increase in sympathetic stimulation and decrease in parasympathetic stimulation causing withdrawal of vagal tone (23,28).

HUT of 30^0 and 60^0 produced increase in rate pressure product (RPP) but this increase was more at 60^0 head up tilt. HUT of 60^0 produced more significant increase in its value throughout the duration of HUT. The increase in RPP was caused due to increase in SBP and HR.RPP (Robinson's Index) was expressed as RPP = SBP X HR $X10^{-3}$(29). RPP indicates myocardial oxygen consumption and cardiac work in normal subjects as well as patients with heart diseases (22). It also indicates onset of ischemia in patients undergoing surgery or the onset of coronary pain during exercise (23,24). Higher values of RPP recorded in hypertensive than normotensive indicate more oxygen consumption, coronary blood flow (29) and more myocardial work (19).

Heart rate response to standing/orthostasis (30:15 ratio) was recorded in study group. As mentioned, the ratio less than one was considered abnormal, while ratio between 1.01 to 1.04 was considered as borderline, and the ratio more than 1.04 was considered normal (30,31). In baroreflex activation in response to standing, the initial cardiovascular response are due to vagal withdrawal, and the later responses are due to sympathetic activation. Hence 30:15 ratio is considered as an index of parasympathetic activation (32).

The recorded response indicated wider fluctuation in heart rate response at selected body postures. None of the body posture could maintain normal heart rate response to changed posture. This wide fluctuation indicated baroreflex dysfunction in all subjects due to head up tilt.

The heart rate response to orthostatic test in normal subjects consists of tachycardia (maximum heart rate) around 15^{th} beat followed by relative bradycardia around 30^{th} beat after standing (33).

Vardan et al (34,35) has studied the effect of head up tilt at 45^0 on baroreflex test. They have found less value of 30:15 ratios than supine position indicating, baroreflex dysfunction. Findings in present study are consistent with this study and head up tilt can be used as orthostatic stress inducer than active standing.

Clinically, functional integrity of autonomic nervous system is tested by using Valsalva maneuver (36). The Valsalva ratio and E:I ratio recorded non-significant increase in its values as compared to basal value recorded in supine position, at both angles of head up tilt. These change in Valsalva ratio can be related with selected body posture, since the quantitative changes observed in Valsalva maneuver may be mainly affected by the posture of the subject (36).So it is necessary to standardize posture effect on Valsalva maneuver.

However, like Valsalva ratio, E:I ratio was not significantly affected by graded head up tilt (37).These finding are similar with other studies, where increase in these parameters is mainly caused due to increased sympathetic activity at low levels of tilts and decreased parasympathetic activity at higher levels of head up tilt (38, 33).

From this study it is concluded that head up tilt cause more significant effect on cardiovascular parameters as compared to parasympathetic responses. Cardiovascular parameters are more affected at 60^0 head up tilt, indicating increased sympathetic activity with low level tilts and an interaction between increasing sympathetic activity and decreasing parasympathetic activity at high level tilts (39).

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Original Article

RETROSPECTIVE ANALYSIS OF DEATH DUE TO BURNS IN RURAL REGION

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Original Article

RETROSPECTIVE ANALYSIS OF DEATH DUE TO BURNS IN RURAL REGION

Dr. U Gonnade, Dr. JM Farooqui

Abstract:

Death due to burning is not uncommon in India, which is mostly amongst the married women. Therefore investigation of these cases is essential to find out various preventive measures for health policies. The present study was undertaken in Department of Forensic Medicine at Rural Medical College, Loni. In it the deaths were retrospectively analysed from the available records of burns victims that were autopsied during a period 2006 to 2010. In present study, the data was analysed in view of age, gender, marital status, percentage of burns, hospital stay of victim of thermal burns. Analysed data was tabulated and represented graphically.

Key words: Burns, percentage of burns, rural region.

Introduction:

Burning of married women in India is a major concern for the Government, law enforcing authorities, the judiciary, the police and medicolegal experts all over the country.

The impact of burns, especially severe ones, is worse in the developing countries compared to high income countries because of infections and lack of adequate physiotherapy.(1)

As per the global estimates of causes of deaths related to injuries, the total deaths from unintentional causes were 35,51,000 (6.2%). They included 11,92,000 (2.1%) deaths due to road traffic accidents, 3,50,000 (0.6%) deaths due to poisoning, 3,92,000 (0.7%) due to falls, 3,12,000 (0.5%) due to fires, 3,82,000 (0.7%) due to drowning and 9,23,000 (1.6%) deaths due to other injuries. The same study reported Intentional causes of deaths (2.8%), which included 8,73000 (1.5%) deaths due to self-inflicted injuries, 5,59,00 (1.0%) due to violence and 1,72,000 (0.3%) due to war injuries.[1]

Among all male deaths 44.64% were due to unintentional causes, 22.38% due to intentional causes, whereas 24.0% females died of unintentional causes and 8.92% of intentional causes.[1]

The mortality in the SEAR Country due to unnatural disasters during 2001 to 2003 is 234368, 243394, 244671 respectively and natural disasters 36651, 16723, 14954 respectively. Number of Burn deaths in India during this period is 22449, 21004, 19278 respectively.[1]

Aims and Objectives:

1. To collect data to find out various informations related to age, sex, marital status & surface area of burn to prepare policy to prevent occurrence of burn in rural society.
2. To know the trend of death due to burns.
3. To know the demographic distribution of burns.
4. To identify vulnerable individuals.
5. To know the magnitude of mortality due to burns.
6. To know the survival period.

Material and Method:

The present retrospective study was conducted in the Department of Forensic Medicine and Toxicology, Rural Medical College, PIMS(DU), Loni(M.S.), for the period between 01/01/2006 to 31/12/2010. Information regarding Age, Sex, Hospital stay, address was gathered from the data available in the department.

Inclusion Criteria:

1. All cases of burns admitted in hospital of rural medical college between the year 2006-2010
2. The bodies which were received in the institution for postmortem examination.

Exclusion Criteria:

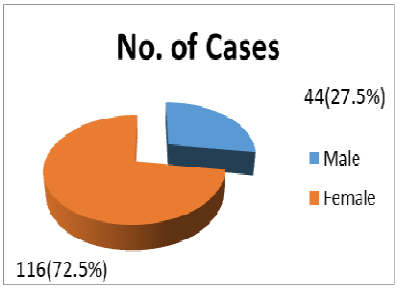
1. The bodies brought dead to the hospital
2. Burns other than Flame Burns.

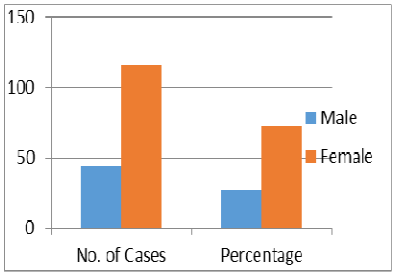
Results:

Out of total 958 autopsies which were conducted at Department of Forensic Medicine and Toxicology, Rural Medical college, PIMS, Loni, (M.S) during the study period from 1st January 2006 to 31st December 2010, 168 were burns deaths, 160 cases were admitted in the hospital and 8 cases were brought dead to the hospital. There was no regular pattern in the incidence of burn over the study period.

Table:-1 Gender wise Distribution of cases of burns.

Sex	No. of Cases	%
Male	44	27.50
Female	116	72.50
Total	160	100

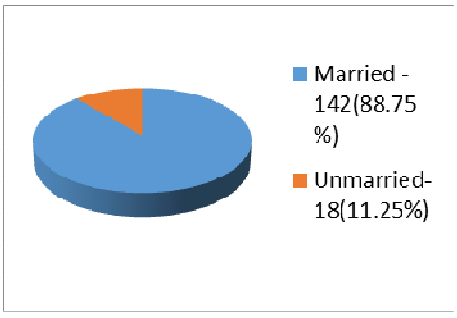




It is observed that out of 160 cases of burn 116 cases were females and 44 cases were males and the male : female ratio was 1:3 (Table-1)

Table:-2 Marital status of victims.

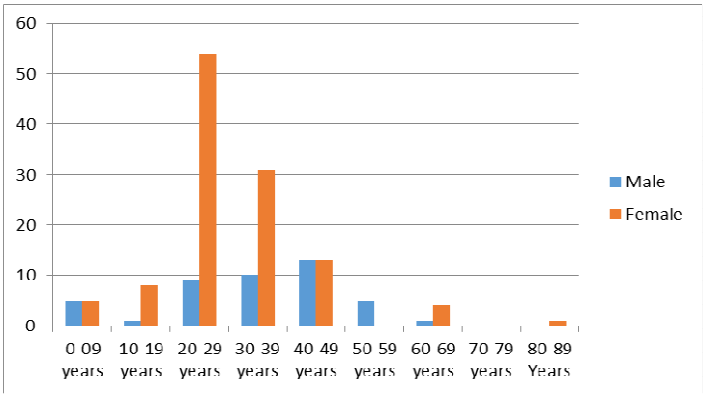
Marital status	Number of cases	%
Married	142	88.75
Unmarried	18	11.25
Total	160	100



Maximum number of burns victim were married, out of which, about 75% were females. Amongst 18 (11.25%) unmarried burns victims 12 (66.66%) were females.

Table-3 : Age and Gender wise distribution of the victims of burns

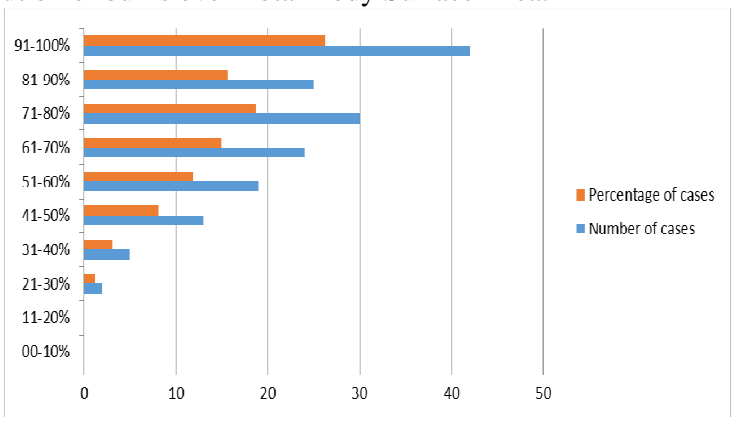
Age group (Yrs)	Male	Female	Total
0-09	05	05	10
10-19	01	08	09
20-29	09	54	63
30-39	10	31	41
40-49	13	13	26
50-59	05	00	05
60-69	01	04	05
70-79	00	00	00
80-89	00	01	01
Total	44	116	160



It is observed that maximum number of cases were in the age group of 20-29 years, and minimum number of cases were found in the age group of 70-79 years, and no cases were found above the age of 90 years. More male victims were present in age group 50-59 years and more female victims in age groups of 10-19 years, 20-29 years, 30-39 years, 60-69 years and 80-89 years. Mortality were same between the age groups 00-09 years, 40-49 years and 70-79 years.(Table- 3)

Table-4:-Distribution of burns over Total Body Surface Area.

% of Burn	No of cases	% of cases
00-10%	00	00
11-20%	00	00
21-30%	02	01.25
31-40%	05	03.125
41-50%	13	08.125
51-60%	19	11.875
61-70%	24	15.000
71-80%	30	18.75
81-90%	25	15.625
>90%	42	26.25
Total	160	100



As regards the body surface area involved, it was observed that more than 80% of body surface area is involved in 67(41.875%) cases. (Table-4)

Table:-5 Survival period of victims of burns		
Survival Period	Number	%
< 24 Hrs	32	20.000
1-3 days	11	6.875
3-5 days	32	20.000
5-7 days	26	16.25
1week-1 month	43	26.875
>1month	03	1.875
Not known	13	8.125
Total	160	100

Out of 160 cases, in 147 the period of survival was known however in 13 cases, the time of death was not available. Maximum period of survival was more than one month in 03 cases. Maximum number of cases died within 24 hours of admission i.e. 32 (20%). 91(63.125%) cases died within one week of admission. (Table-5)

Discussion:

Burns in developing countries like India is endemic and continues to be a major challenge to the health care provider and society.[2] Though there is no time trend in this region, yet 17.70% of the total deaths are autopsied. However, virendra kumar et al[2] in hisstudy reported this rate as 19.40%.

Total number of postmortem examination conducted at department from 2006, 2007, 2008, 2009 and 2010 were 183, 151, 175, 203 and 246 respectively. Total number of deaths due to burns was 22, 23, 25, 48 and 42 respectively during year 2006 to 2010. Thus the during the years 2006-2010, respectively 12.02%, 15.23%, 14.28%, 23.64%, 17.07% of cases died due to burns. Data shows increase in number of deaths due to burns from 2006 to 2009 however, the rate dropped in 2010. Hence, Out of the 958 autopsies performed on all types of unnatural deaths between 1st January 2006 to 31 December 2010, 160(16.70%) were conducted on bodies that have died due to burns, which is 3% less from the study of Virendra Kumar et al[2].These 160 fatal burns cases forms the material of this study in respect to data of age, sex, marriage, percentage of burns and hospital stay.

Out of total 588 suicidal deaths studied by Mohanty S et al[3], 71.4% were married and 28.6% were unmarried. In present study data deaths due to burns are more common amongst the married subjects. This may be due to the reason associated with the marriage. Both in married and unmarried subjects, female outnumbered males.

Virendra Kumar et al[2] observed 75% of female burns victims. In present study we find that incidence of burns is more common among females in all age groups except in the elderly and age group 50 to 59 years of age, where male are at higher risk. Amongst all age groups 72.50% were females.

In the study conducted by virendra kumar et al[2], about 78% of the victims were in the age group of 11-40 years. Highest deaths were reported between age 21-30 years in study conducted at North Karnataka by Tapse SP et al[4]. In Manipal, Palimar V and Raghavendra Babu Y.P[5] have conducted 14 years retrospective study in below 18 years age group and found that, out of total 42 cases, maximum cases (42.8%) of burns were between 13-18 years of age. In our study about 53% of the victims were in the age group of 21 to 40 years, and about 70% of the victim were in the age group of 11 to 40 years.

In the study of virendra kumar et al[2], the overwhelming majority (92.50%) of the victims had more than 40% of total body surface area (TBSA) burns indicating the incompatibility with life even at a tertiary care center. About 94% mortality in over 40% of TBSA was reported in study from North Karnataka by Tapse SP et al[4]. In Manipal, in the study conducted by Palimar V et al[5], below 18 years of age, 54.9% of deaths were reported with burns above 60% of TBSA. In our study, 95.62% mortality is in cases of over 40% of TBSA.

Tapse SP et al[4] , in their study reported less than 1 hour survival period in 49% burns deaths, 3 to 7 days survival in 08% deaths and one week survival period in 78% deaths. In our study 63.12% of burns deaths are within a week and 36.25% burns deaths between 3-7 days of the incidence of burns.

Conclusion:

The present study highlights the following features pertaining to the burn deaths:

1. Majority of deaths occurred in the married subjects (about 89%).
2. Majority of the burns victims are females in child bearing age (about 71%).
3. Peak incidence of mortality due to burns was observed in adolescent and young age groups (11-40 years).

4. Mortality of 96% was observed in subjects having TBSA of above 40%.
5. Majority of deaths occurred within a week of the incidence (about 63%).

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Original Article

TO STUDY THE CHANGES IN THE PALATINE RUGAE PATTERN DURING VARIOUS ORTHODONTIC TREATMENT

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Original Article

TO STUDY THE CHANGES IN THE PALATINE RUGAE PATTERN DURING VARIOUS ORTHODONTIC TREATMENT

Introduction:

Palatal rugae, also called 'plicae palatinae transversae' and 'rugae palatine', refers to the ridges on the anterior part of palatal mucosa, present on each side of the median palatal raphe and behind the incisive papilla. Carrea (1937) indicated that a rugae pattern is formed by the12th to 14th week of prenatal life, and it remains stable throughout the person's life.[1] The anatomical position of the rugae inside the mouth surrounded by cheeks, lips, tongue, buccal pad of fat, teeth and bone keeps them well-protected from trauma and high temperatures.[2]

Histologically, the rugae are stratified squamous (layered scales), mainly parakeratinized, epithelium on a connective tissue base, similar to the adjacent tissue of the palate. Thomas [3] reported differences in the rugae cores taken from human embryos of over 20 weeks. He found the reticulin fiber content to be very delicate and the fibroblasts to be different in amount and size from that in adjacent palatal tissue. Many researchers have studied the morphology of palatal rugae and the racial differences, but very few have studied the individuality of palatal rugae. Palatine rugae can be used as internal dental-cast reference points for quantification of tooth migration in cases of orthodontic treatment.

Sassouni[4] have stated that no two palates are alike in their configuration and that the palatoprint does not change during growth. They are considered to be stable throughout life (following completion of growth), although there is considerable debate on the matter.[5] Once formed, they do not undergo any changes except in length (due to normal growth) and remain in the same position throughout a person s entire life.[6,7] Thomas and Van Wyk successfully identified burnt edentulous body by comparing the rug pattern on the victim's old denture; this indicate other things, that rugae are stable in adult life.[8]

Palatoscopy or Rugoscopy is the name given to the study of palatal rugae in order to establish a person's identity.[7] The application of palatal rugae patterns for personal identification was first suggested by Allen' in 1889. Palatal rugoscopy was first proposed in 1932, by a Spanish investigator named Trobo Hermosa. In 1937, Carrea conducted a detailed study and established a method to classify palatal rugae. In 1983, Brinon, following the studies of Carrea, divided palatal rugae into two groups (fundamental and specific) in a similar way to that done with fingerprints.[9]

In this manner, dactyloscopy (study of fingerprints) and palatoscopy (study of palatal prints) were united as similar methods based on the same scientific basis. The two systems are sometimes complementary: for instance, palatoscopy can be of special interest in those cases where there are no fingers to be studied (burned bodies or bodies in severe decomposition).[7]

Very few studies have been undertaken to establish the reliability of palatal rugae pattern in individual identification which could play a very important role in forensic sciences. However, rugoscopy can be applicable for forensic identification only when there is available antemortem information for comparison such as dental casts, tracings or digitized rugae patterns. Previous studies may not have considered the effects of growth, extractions, palatal expansion, or some combination of these. The inadvertent use of other features of the cast, such as teeth, edentulous ridge morphology, muscle attachments, vestibular depth, or some combination of these, to aid in the identification, may have influenced their results.

Thus the present study will evaluate accuracy of identification by comparing the rugae patterns on pre-operative and postoperative orthodontic cast photographs overcoming these limitations. The purpose of this study is to determine if palatal rugae can be relied upon for identification of the individual and whether it can play a definite role in forensic science.

Aims & objectives:

1. To study the changes in the rugae pattern during orthodontic treatment.
2. To determine the stability of the palatine rugae pattern during orthodontic treatment.
3. To verify the accuracy rate of identification by comparing the rugae pattern on preoperative & postoperative orthodontic treatment.

Materials & Methods:

1. 90 orthodontic casts
2. 30 pre orthodontic treatment cast photographs
3. 30 post orthodontic treatment cast photographs
4. 30 randomly selected cast photographs as control.
5. Black marker, 0.5 graphite pencil, ruler, digital camera (SONY CORP.SIT-A,MODEL NO. DSC-W530,3.6 V:14.1 Mega Pixels)

90 orthodontic casts of patients were obtained from the Department of Orthodontics for this study. These 90 casts were divided into three groups.

The first group consisted of 30 preoperative orthodontic casts. The second group consisted of 30 postoperative orthodontic casts of the same patients as in the first group. The third group consisted of 30 randomly selected casts.

Out of 30 patients, 24 had history of extraction of a premolar tooth for fixed orthodontic purpose, while six patients had no history of extraction. Four patients had history of dento-alveolar expansion (from 3 mm to 8 mm); 24 patients had history of proclination (from 3 mm to 10 mm) which had been treated with edgewise therapy. The duration of treatment varied from 8 months to 24 months.

Fig.1 Preoperative Orthodontic Casts Photographs

The rugae patterns on all the casts were delineated using a sharp graphite pencil under adequate light and magnification according to the classification given by Kapali *et al*[10].

A digital camera was placed in the horizontal plane with a spirit level at a fixed distance of 20 cm. Every cast was brought under the camera for the photograph. The aperture on the digital camera was set at maximum to achieve the best field of depth and the picture quality set at 4.0 megapixels. Photographs of all the casts were taken after delineating the rugae.

The first group of 30 preoperative cast photographs were numbered as 1-30. (Fig.1)

All the images of the casts were imported into CoralDraw® Graphics Suite. All the images of the postoperative casts & randomly selected casts were cropped, So that all areas except palatal rugae of the hard palate was removed. This step ensured that the teeth, the edentulous area, and the vestibule would not have any influence and that only the palate would be used in the identification process. (Fig. 2)

After that these images (cropped) were obtained on the photo paper. 30 Postoperative cast photographs were mixed with 30 photographs of the randomly selected cast photographs. The second group consisted of postoperative cast photographs (Fig.3) and randomly selected casts photographs (Fig.4) mixed together and numbered randomly.

Fig.2: Cropped Image

16 examiners were selected as evaluators. They were professors, readers, senior lectures & PG students from the department of Oral Pathology, Prosthodontics & Orthodontics. They were instructed to match the preoperative casts photographs with other 60 photographs (30 postoperative & 30 randomly selected). The number of photographs that were correctly matched was noted. The case numbers of the preoperative casts photographs with that of the matching postoperative dental casts photographs were recorded but not revealed to the evaluators.

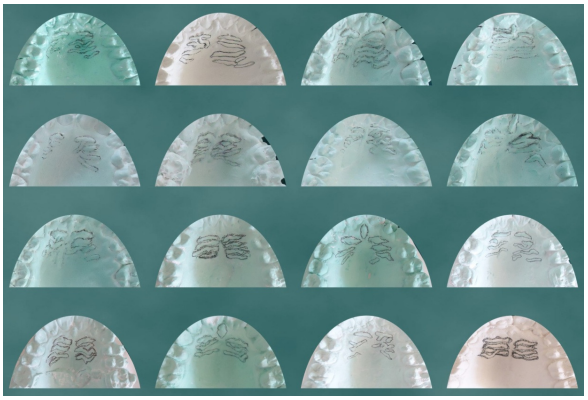


Fig. 3:Cropped postoperative orthodontic casts

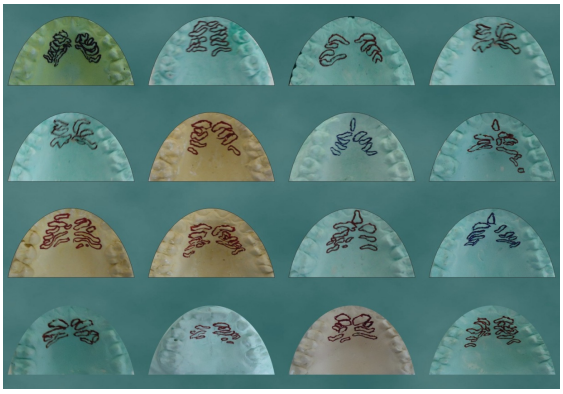


Fig.4 Cropped Randomly Selected Orthodontic Casts Photographs

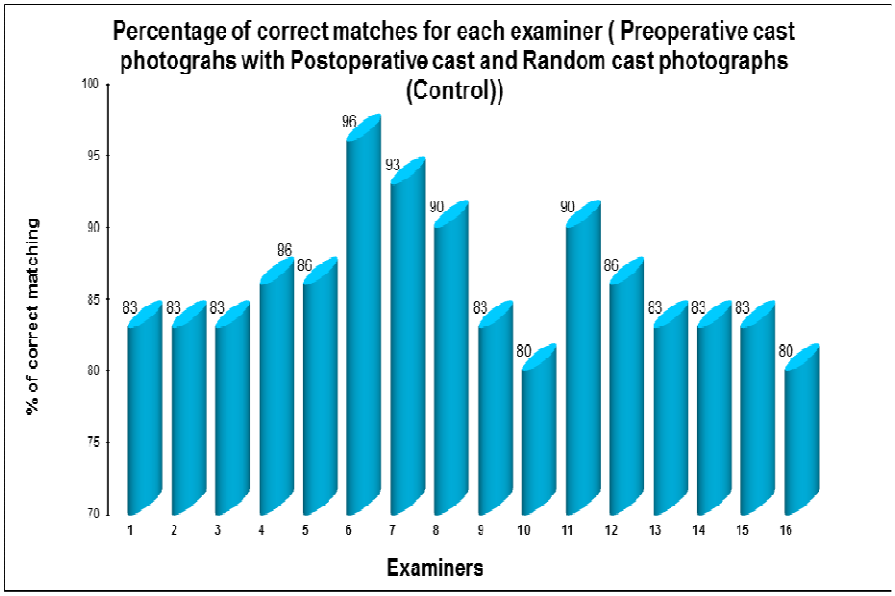
The examiners selected the closest match based on pattern of rugae. The correctness of the match for each examiner (Fig.5) & for each cast photograph (Fig.6) was calculated as the percentage of correct matches.

These photographs of the casts were kept as a permanent antemortem record in the department of oral pathology under the forensic odontology section for the future.

Discussion:

The accuracy of identification of palatal rugae patterns by four investigators & two team was reported by English et al.[11]to be 100%, except for one investigator who achieved only 88% correct matches. Limson & Julian [12] who compared some points of the rugae patterns using computer software reported that the percentage of correct matches ranged from

92% to 97%. Maki Ohtani et al who examined the accuracy rate of identification in edentulous cases, about 94%.



In the study conducted by Bansode & Kulkarni et al., 13 examiners achieved 90% correct matches. They analysed only some changes in the rugae pattern during orthodontic treatment by evaluating the preoperative and postoperative orthodontic casts of 60 patients. They also assessed that the morphology of palatal rugae remains stable throughout life and carefully assessed rugae pattern has definite role in forensic practice.[9]

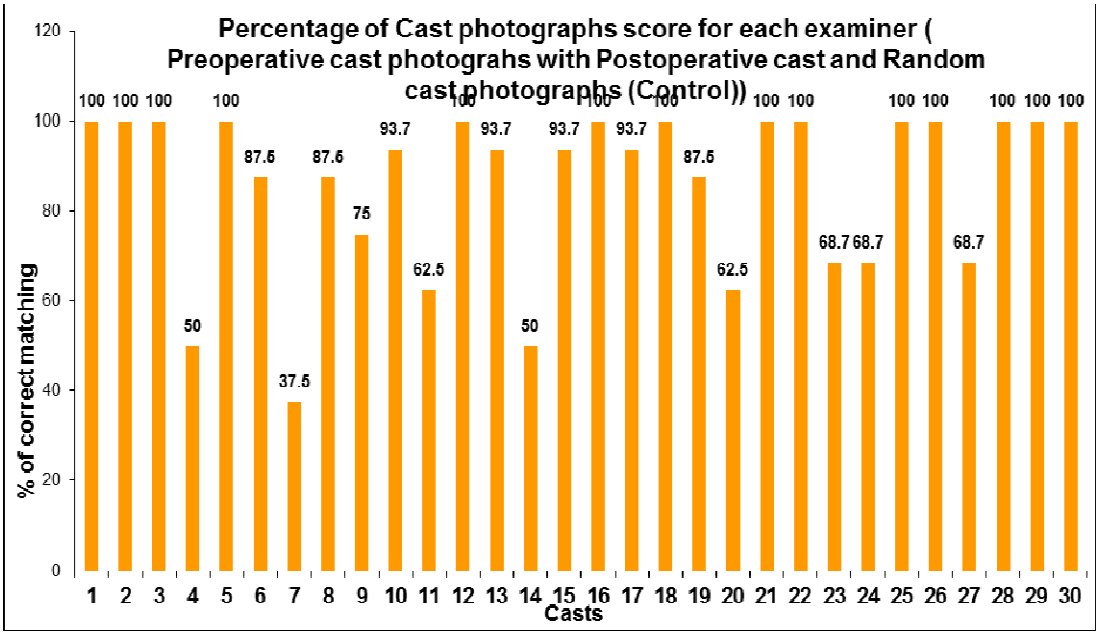


Fig.6: Percentage Of Cast Photograph Score For Each Examiner

Rugae patterns have been studied for various purposes, in the field of anthropology, comparative anatomy,[13] genetics, forensic odontology, Prosthodontics and orthodontics.[14]

In the literature, the consensus of opinion is that the rugae remain fairly stable in number & morphology except when there is trauma, such as loss of tooth, persistent pressure, extreme finger sucking, orthodontic tooth movement which may modify the alignment.[15]

Various investigators have implied that palatal rugae are unique to each individual and they can be used successfully in human identification.

Fig.7: Non Specific Rugae Pattern

The importance of dental identification is on the rise year after year. With the passage of time, the role of forensic odontology has increased as very often teeth and dental restorations are the only means of identification.[16] However, researchers have disagreed as to whether or not legal identification could be based solely on palatal rugae. Controversy also exists about the stability of quantitative and qualitative characteristics of rugae during growth.

English et al [11]and Peavy and Kendrick [17] noted that the characteristic pattern of the palatal rugae did not change as a result of growth, remaining stable from the time of development until the oral mucosa degenerated at death. Van der Linden proved that the anterior rugae do not increase in length after 10 years of age. Also the qualitative characteristics such as shape, direction and unification remain stable throughout life. However, Hauser et al have suggested that the mean rugae count changes moderately in adolescence and then increases markedly from the age of 35 to 40 years. In contrast, Lysell considered that the number of rugae decreased from 23 years of age onwards.9 Some events can contribute to changes in rugae pattern, including trauma, extreme finger sucking in infancy, and persistent pressure with orthodontic treatment and dentures.9 It has been suggested that changes in the length of rugae with age result from underlying palatal growth.8-10 Furthermore, Bailey et al, Almeida et al and Abdel-Aziz et al concluded that movement of teeth may change the position of the rugae points.[6]

Dental casts are three dimensional (3-D) records of malocclusion that have been used successfully during diagnosis and treatment planning for orthodontic patients. The palatine rugae are unique to each patient and are reasonably stable during the patient's growth thus, they may serve as suitable reference points from which the clinician can derive the reference planes necessary for longitudinal cast analysis. Positional changes of posterior teeth in the antero-posterior direction are relevant to the diagnosis and correction of sagittal occlusal abnormalities and arch length discrepancies. Hausser observed orthodontically treated patients and concluded that the lateral edges of the rugae moved forward about one-half the distance of the migration of the adjacent teeth, while the medial rugae were not affected. In a study of changes occurring in 14 patients who underwent extraction of four premolars, Peavy and Kendrick reported that the lateral ends of the rugae that terminated close to the teeth followed the movement of the teeth in the sagittal plane, but not in the transverse plane.[18]

In the present study 16 examiners with the help of cast photographs of the palatal rugae studied the changes occurring during the various orthodontic ttreatment.The accuracy rate of identification by comparing the rugae patterns from the cast photographs observed & noted.

The matching of preoperative and postoperative orthodontic casts photographs demonstrates that the changes occurring following extractions and tooth movement do not significantly alter the pattern of rugae. In the cases where arch expansion was undertaken, the morphology of the rugae was not altered, though there was a definite increase in the length of the rugae. A common concern

about palatal rugae voiced by many researchers is the possibility of rugae patterns changing with age and other outside. However, some examiners did have problems during matching, which may have been due to non-specific rugae patterns, (FIG.7)overlapping of rugae, and poorly demarcated rugae. Because of which some casts had difficulty in matching.

Orthodontic movement, extraction of teeth, cleft palate surgery, periodontal surgery, and eruption of an impacted canine are only some of the concerns. Most dental identification is based on comparison of teeth and associated restoration, but identification based on rugal characteristics is not always possible. Instances could occur in which the palate remains intact due to its position, while most other anatomical structures are destroyed, burned, or dehydrated. Therefore, anatomical structures such as palatal rugae may assume more importance in the future.

This method of identification can be used only when an ante-mortem record of the palatal rugae is available. This could simply consist of dental cast photographs. However, other methods of recording the rugae pattern are possible for identification purpose, which might include, palatal prints, or computerized tomography of the rugae pattern. In future there is need to conduct study using other means & large data.

Conclusion:

It was concluded that although some changes do occur in the rugae during orthodontic treatment, the morphology of palatal rugae remains stable throughout life and carefully assessed rugae pattern has definite role in forensic practice. It appears that the pattern of palatal rugae is unique to each individual and that it can therefore be used for establishing identity.

The collected data can be used as a antemortem data in the department under the section of forensic odontology for the future in personal identification when the other means of identifications are lost or cannot be used**.**

Results:

Table 1 shows the percentage of correct matches for all 16 examiners; this ranges from 80% to 96%, with a mean of 85.5 % (SD $\pm$ 4.57) and a median of 83% .(FIG.4)

Table 2 shows the percentage of correct matches for each case, this ranges from 37.5% to 100 % with mean of 86.03 % (SD + 18.62) and a median of 93.7.(FIG.5)

By applying Wilcoxon Matched Pairs Signed Rank Test the **median** of the differences of Percentage of correct matches from Preoperative cast with Postoperative cast and Preoperative cast with Postoperative cast and Random cast (Control) differ significantly.

Non-parametric Spearman correlation coefficient i.e. value of $r = 0.8835$, $p<0.001$

Thus effective matching results in a significant correlation between Postoperative cast and Preoperative cast with Postoperative cast and Random cast (Control). That is the matching appears to the effective**.**

Statistical analysis:

Statistical analysis were done by computing descriptive statistics i.e. mean, median, standard deviation, percentage, 95% and 99% confidence intervals. The Non parametric test Wilcoxon Matched Pairs Signed Rank Test and Non-parametric Spearman correlation coefficient were applied for matching of Percentage of correct matches and cast score for each examiner.

The probability value (i.e. p, 0.05) considered as significant. The statistical analysis software **SYSTAT version 12** (Cranes Software, Bangalore, India) were used to analyze the data in this study.

Examiner score:

Table No.1: Percentage of correct matches for each examiner (Preoperative cast photographs with Postoperative cast photographs and Random cast photographs (Control)

Examiners	Percentage of correct matches
1	83
2	83
3	83
4	86
5	86
6	96
7	93
8	90
9	83
10	80
11	90
12	86
13	83
14	83
15	83
16	80
Mean ± SD	**85.50±4.57**
Range	**80-96**
Median	**83**
95% CI	**88.168**
99% CI	**87.93**

Cast score

Table No. 2: Percentage of Cast photograph score for each examiner Preoperative cast photographs with Postoperative cast photographs and Random cast photographs (Control):

Casts	Percentage of correct matches by examiner
1	100
2	100
3	100
4	50
5	100
6	87.5
7	37.5
8	87.5
9	75
10	93.7
11	62.5
12	100
13	93.7
14	50
15	93.7
16	100
17	93.7
18	100
19	87.5
20	62.5
21	100
22	100
23	68.7
24	68.7
25	100
26	100
27	68.7
28	100
29	100
30	100
Mean ± SD	**86.03 ± 18.62**
Range	**37.5-100**
Median	**93.7**
95% CI	**79.08**
99% CI	**92.98**

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We wish to thank Mr. Hemant Pawar, Statistician, Pravara Institute Of Medical Sciences Loni for his valuable contribution.

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Original Article

EVALUATING UNIQUENESS AND PREDOMINENT PATTERN OF LIP PRINTS: A STUDY ON STUDENTS FROM ACADEMIC INSTITUTE

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Original Article

EVALUATING UNIQUENESS AND PREDOMINENT PATTERN OF LIP PRINTS: A STUDY ON STUDENTS FROM ACADEMIC INSTITUTE

Dr. M Kulkarni, Dr. M Ashraf

Abstract:

Cheiloscopy is a forensic investigating technique that deals with identification of humans based on lips traces. Lip print has already proven to be unique to each individual, its examination and comparison at the crime scene with those of suspected person might prove to be an important tool in persuasion to secure law and justice. The prime aim of the study was to evaluate the predominant pattern of lip print by using two different methods and to study the uniqueness of lip prints. The pattern of lip prints was recorded by two methods and studied along the entire length and breadth and classified according to Suzuki and Tsushihashi's classification. No two lip prints matched with each other, thus establishing the uniqueness of lip prints. Type I and I' pattern was predominant in females; type II pattern showed almost equal distribution between males and females whereas type III, IV and V was seen to be more prominent in males. Both methods of recording lip print are equally accurate.

Key Words: lip prints, identification, sex determination.

Introduction:

Establishment of a person's individuality is of significance for legal as well as humanitarian purpose and gender determination is an essential step in identifying an individual. Many methods are being used for this purpose like DNA analysis, dental assessment, finger printing. However, since they cannot always be used, so there is a need for a reliable alternative method for establishing identity. [1]

Similar to finger, palm and foot prints, lips possess furrows and grooves that can be classified into various types for identification purposes. The grooves present on lips are unique to an individual and hence can be used as a tool for identification process. The study of these grooves of furrows present on the red part of the lips is known as Cheiloscopy. [2]

Earlier studies have clearly shown that the lip prints can be used for personal identification as well as determination of sex [3, 5].

R. Fischer an Anthropologist was the first to describe these groves and fissures in 1902. [3] In 1932, Edmond Locard acknowledged the importance of importance of Cheiloscopy. In 1950, Le Moyer Snyder mentioned in his book 'homicide Investigation' about the possibility of using lip prints in human identification. [4]

Aims and Objectives:

1. To evaluate the predominant pattern of lip Print by using two different methods.
2. To study uniqueness of lip prints.

Materials and Methods:

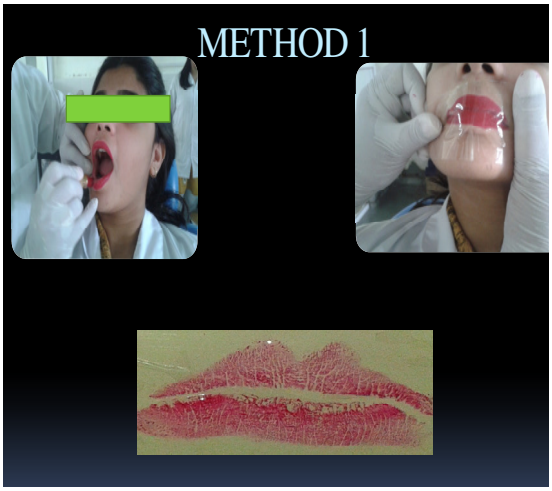
The materials used in the present study are red coloured lipstick, cellophane paper**,** bond paper, cello tape, microscope glass slide, fine black carbon powder (No.2015), ostrich brush**,** magnifying glass[11].

The study was conducted on a group of 100 students of Rural Dental College, Loni, within the age group of 17 to 21years. Care was taken in selecting subjects having no lip

lesion or any lip scar or deformity. Subjects having hypersensitivity to lipstick were not included in the study.

The subjects were divided in two groups, Group A and Group B. Each group contains 50 males and 50 females. A verbal consent was obtained from the subjects. The subjects were made to sit on the dental chair in a relaxed position.

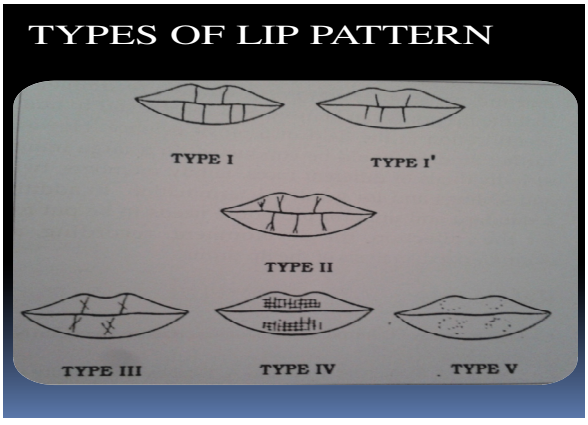
Two methods were used to record the lip prints.



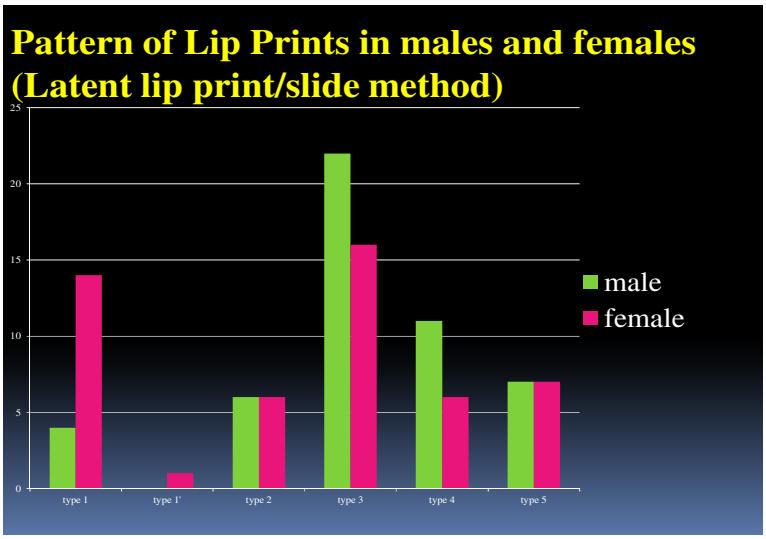
Method 1: Lipstick was applied to the lips of the subject in a single stroke then, a cellophane paper was applied over the lips and lip prints were recorded on the cellophane paper. This cellophane paper was placed over the bond paper and a sticking cello tape was applied over it. The print was then studied using a magnifying glass under bright light.

Method 2 - Latent lip prints are taken on a clean and dry microscopic glass slide in a single motion without applying anything. They are developed by sprinkling black carbon powder using an ostrich brush. Any excess carbon powder was dusted off and a cello tape was placed on top of the glass slide. Then using a magnifying glass, the lip prints were studied in bright light

Lip prints obtained by both the methods are classified according to Suzuki and Tsuchiashi classification. These authors considered six different types of grooves:

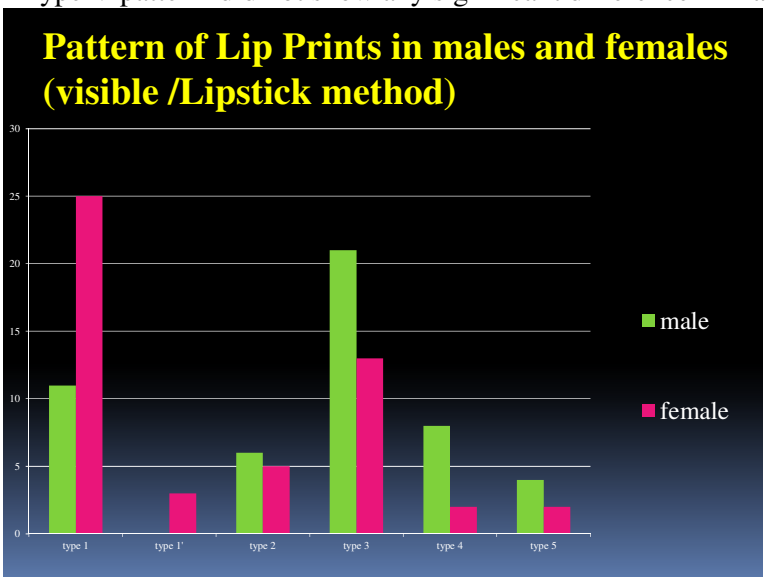


Classification	Groove type
Type I	Complete vertical
Type I'	Incomplete vertical
Type II	Branched
Type III	Intersected
Type IV	Reticular pattern
Type V	Irregular



RESULTS:

- No two lip prints matched with each other, thus establishing the uniqueness of the lip prints
- The Type I pattern was seen predominantly seen in females by both methods. Type I' pattern was seen only in females by both methods.
- Type II pattern was equally seen in seen in males (%) and females(%).
- Type III pattern and IV pattern was prominently seen in males (%) than females (%).
- Type V pattern did not show any significant difference in male and female (%).



Discussion:

Cheiloscopy is the study of lip prints and has presently become one of the upcoming tools for the identification of a person. Lip prints are considered to be unique to an individual and do not change during the life time of a person. Lip print identification is widely used in criminal and forensic practice [7,8].

Lip prints left at the crime scene should be dealt and handled carefully. At the crime scene lip prints can be obtained from windows, doors, cups, cigarette butts, clothes and other sites. Lip pattern can be used as a tool to identify the gender of victim & suspect in crime or other calamities. Lipstick smears can lead to indirect proof of a relationship or contact between a victim and a suspect or suspect and a crime scene. [7]

While searching for lip prints, one must always consider that not all lipstick smears are colored. Recently the cosmetic industry has developed lipsticks which do not leave mark or a smear, these are known as persistent lipsticks[9]. In such situation, although invisible, these prints can be lifted using materials such as aluminum powder and magnetic powder.

The identification of latent print evidence is often considered the key in solving a crime. [10]

The present study was carried out on 100 students, divided equally in males and females. The lip prints were studied using two different methods, one method used visible lip print (lipstick method) while the other used the invisible lip prints (slide and carbon powder

method) Lip prints obtained were classified according to Suzuki and Tsuchiashi classification.

In our study, no two lip prints matched with each other thus establishing uniqueness of lip prints which was in accordance with earlier studies done by Simarpreet et al, Rashmi et al, Jagdish et al.

It was found that Type I pattern [clear cut vertical grooves that run across the entire lip] was seen predominantly in females which was established by both methods. Type I'pattern [the grooves are straight but disappear half way instead of covering the entire length] was seen only in females by both methods.

Type II [the grooves fork in their course] was seen equally in males and females which is an agreement with earlier studies done by Maheshwari etal and Shilpa etal.

Type III[the grooves intersect] and IV pattern [the grooves reticulate]was prominently seen in males which is in agreement with studies done by Gondivkar et al.

Type V [the grooves do not fall into any of the types I-IV and cannot be differentiated morphologically] did not show any significant difference in male and female lip patterns.

The present study is able to convey that lip prints behold the potential of determination of the sex. Both methods which were used to record lip prints showed almost similar results thus confirming the fact that both methods are reliable and can be used to record lip prints for future study on lip prints.

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Original Article

PROFILE OF MEDICO-LEGAL CASES COMING TO CASUALTY OF GOVERNMENT MEDICAL COLLEGE, AKOLA

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Original Article

PROFILE OF MEDICO-LEGAL CASES COMING TO CASUALTY OF GOVERNMENT MEDICAL COLLEGE, AKOLA

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Abstract:

Causality department of any hospital is an important area because most of medical emergencies and almost all medico legal cases report first to causality of hospital. The prime duty of doctor is to treat and save the life of patient, however once treatment is over then same doctor has to carry out exhaustive documentation of medico legal cases. This puts on extra burden on duty Doctor. The present study is carried out with a view to understand the pattern and magnitude of Medico legal cases in this region so as to identify methods to prevent and reduce incidences, if any. One year retrospective study was carried out between 1st July 2012 to 30th June 2013 from the in the causality data of Government Medical College, Akola.

Study revealed that Burns (21.87%) constituted majority of medico legal cases followed by assault (19.72%) and road traffic accidents (16.99%) with male preponderance (3:1); majority of victims were between 21-30 years (38.82%) followed by 31-42 years (19.53%) large number of victims were urban inhabitants (55.91%).

Key Words: Medicolegal cases, Casualty

Introduction:

The casualty department is backbone of every Hospital because almost all cases of Medical emergencies reported first to Casualty Department of Hospital, and apart from these Medical emergencies, Casualty Department also deals with the Medico legal cases more frequently than any other department of Hospital. So Medico legal cases constitute substantial proportion of workload. A medico legal case is a case of Injury or illness where attending doctor after eliciting, listing and examining patient; is of opinion that some investigation by law enforce agencies is essential to establish and fix responsibility for the case in accordance with the law of the land[1] .

Profiling of Medico legal cases is an integral aspect for the prevention of preventable causalities in future and to study the crime rate in area[2].

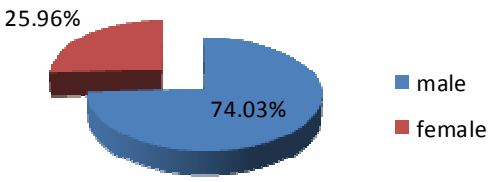
In present study an attempt is made to know the burden of Medico legal cases.

Material and Methods:

This is a retrospective study, conducted in medico legal section and casualty of Government Medical College and Hospital Akola during the period from 1st July 2012 to 30th June 2013. Total 2053 medico legal cases recorded/admitted in medico legal register of casualty department were included in the study which comprised of information regarding various parameters obtained from medico legal register and hospital record of individual patient. The data thus obtained was analyzed, observations were presented in tables & graphs, discussed and compared with other studies.

Observations:

In this study it is observed as follows:



Pie chart shows gender wise distribution of cases. Males (74.03%) outnumbered the females (25.96%).

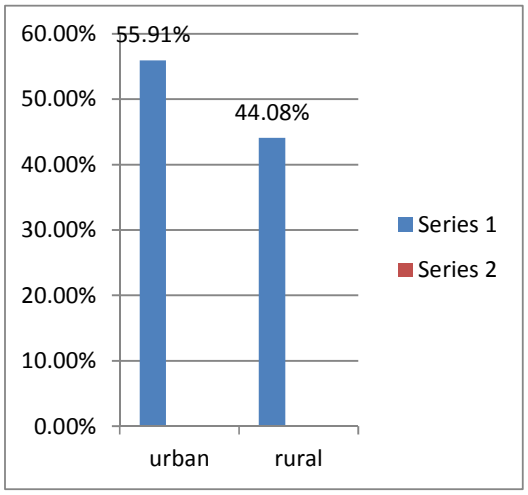
Table I shows that majority of victims (38.82%) from age group 21-30 years followed by 31-40 years (19.53%) and 11-20 years (13.78%).

Age groups	No. of cases	Percentage
0-10	024	01.16%
11-20	283	13.78%
21-30	797	38.82%
31-40	401	19.53%
41-50	336	16.36%
51-60	111	05.40%
61 & above	101	04.91%

Table II shows type of cases. Maximum number of cases were of burns (21.87%) followed by assault (19.72%) and poisoning (18.70%).

Category	No. of cases	Percentage
Burns	449	21.87%
Assault	405	19.72%
Poisoning	384	18.70%
RTA	349	16.99%
Alcohol intoxication	177	08.62%
Sexual assault	41	01.99%
Brought dead	141	06.86%
Near drowning	007	00.34%
Near hanging	003	00.10%
Electric injury	015	00.73%
Other accidents	082	03.99%

Graph shows residence wise distribution. Large number of medico legal cases reported to casualty were from urban area (55.91%) followed by rural area (44.08%)



Discussion:

In the present Study 2053 Medico legal cases reported to casualty department of Government Medical College Akola during study period.

Present study shows maximum number of victim were males (74.03%) as compared to males (25.96%) Similar findings reported by Garg vishal et al[1], Malik yogendra[2], and marrimurad[3]. This is to because males are more involved in outdoor activities and usually the main bread winner for the family, so this makes them more vulnerable to accident or injury.

In present study great number of victims were from age group between 21-30 years (38.82%) followed by 31-40 years (19.53%). Similar finding are also reported by Marri Murad[3] and other workers. This may be due to fact that individuals of these age groups lead more active life, involve themselves in outdoor and sports and recreation activities and they

take risk for work during this period which leads to more injuries and accidents among these groups.

Present study revealed that maximum number of cases were of burns (21.87%) followed by assault (19.72%) and poisoning (18.07%) Garg Vishal etal[1] reported in his study that road traffic accidents cases were highest. Malik Yogendra[2] reported that maximum number of cases were of poisoning and Marri Murad[3] reported maximum number of cases of assault. This discrepancy may be due to fact that later study is conducted in rural set up where people are more involved in agricultural activities, while Garg Vishal[1] conducted study in Punjab where cases of burns usually doesn't report to casualty like Malhotra[4] reported in his study but at Akola all medico legal cases report first to casualty and also due to fact that there are very few private burn care unit in Akola and surroundings District; so that all such cases report to casualty of Government Medical College Akola.

Study revealed that maximum number of victims (55.91%) belonged to urban areas as compared to rural areas (44.08%). These findings of our study differ from the findings of other similar studies. This may be due to fact that study was conducted in rural area and people residing in urban areas are more prone to fall due to traffic accidents, industries, railway mishaps, fall from high rise buildings and other factors.

Present study shows maximum number of medico legal cases reported during rainy season (41.11%) followed by summer (32.19%) and winter (24.74%). Similar findings reported by Garg vishal[1]. This may be due to fact that people around Akola of rural region are involved in harvesting during this season and as this region is draught affected since last decade, so there are more instances of suicides during this season. Also, instances of quarreling, bad weather, poor conditions of roads also contribute to increase in the number of accidents.

Conclusion:

The casualty department of any hospital not only caters to the needs of patients who reports in emergencies but also carry out legal responsibilities to examine, document and certify medico legal cases, this puts a lot of burden on casualty department. Present study shows maximum number of cases of injuries were accidental among young individuals (21-40 years) and urban inhabitants. Injuries can be prevented by proper education, awareness and training of safety standards which are required to be implemented strictly. The doctors who are involved in handling medico legal cases need to be more trained. Also, due to increase in violence and accidents, the need for round the clock availability of medico legal experts, in as much number needed, in casualty and emergency departments to deal with medico legal cases is felt.

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