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Editorial

Once viewed as a discipline at the wet and pungent end of Medicine, Anatomy has had a rebirth with the publication of this inaugural issue of the *Sri Lanka Anatomy Journal*, placing it firmly in the scientific limelight. Let us all toast this singular success in the field of Anatomy and its allied subspecialties.

There is in Sri Lanka as in the rest of the world, an ever changing landscape in the teaching of the basic sciences in the field of Medicine. Anatomy as a discipline is being professionally persecuted and nudged to the brink of extinction by some clinicians and modern educationists, who are nibbling away and diluting the teaching and learning of the subject, riding on the slogan 'Integration'.

This inaugural issue of the *Sri Lanka Anatomy Journal* is certainly a welcome whiff of change to the community of Anatomists. It provides them an opportunity as a well represented professional body to formally showcase their research, use it as a forum to air their professional views and articulate policies on new trends in the teaching of Anatomy and its allied subjects.

The launching and publication of this Journal, was an idea conceived in the mind of Professor Gananda Nanayakara and incubated to reality in a span of a few months. The Anatomists are indebted to him for this seminal contribution and his attempt to catalyze them in a very cohesive way to develop visibility, and justify a formidable presence for our subject in the long road ahead.

This Journal takes its first literary steps 352 years after the publication of the first Journals, the French *Journal des sçavans* and the English *Philosophical Transactions of the Royal Society* which began systematically publishing research results way back in 1665.

My fervent wish is that with the debut of this Journal the young Anatomists will be afforded an opportunity to present their research findings and have the scripts reviewed and edited by peers before they navigate the international scene. May this Journal grow in the years ahead, acquire prestige and succeed in attracting high caliber scientists both in Sri Lanka and overseas to publish their research.

Vidya Jyothi Prof. Rohan W. Jayasekara
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Emeritus Professor of Anatomy

Student Performance and Perception Regarding Descriptive and Case Based Anatomy Questions

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ABSTRACT

Objective: It was the objective of this study to quantify the performance and ascertain the first year students' perception of descriptive and clinical anatomy questions.

Methods: Students in the 1st year 2nd semester at the Faculty of Medicine Peradeniya were recruited. They were given 2 questions similar to exam questions from a familiar area. One question was descriptive, and the other a clinical case scenario. Students were given 30 minutes to answer. Scripts were marked according to a marking scheme and scored out of hundred. At the end of the assessment students were given a questionnaire to gather information regarding their perception regarding the two types of questions.

Results: There were 192 students and all had answered both questions. Average scores were 73.2% for the descriptive question and 65.7% for the clinical case scenario. Of the students 65.3% thought that the clinical case scenario type of question should be given for assessments while 58% said that they preferred to answer this type of question. Eighty two percent said descriptive type of question was easy.

Conclusion: It is evident from these findings that even though students score better in descriptive type of questions a majority think that clinical case based questions should be included in assessment and they prefer to answer such questions.

Key words: student performance, student perception, anatomy examinations.

INTRODUCTION

Anatomy is largely a descriptive science. However when it comes to teaching anatomy to medical students, teaching pure anatomy as a descriptive science has lost its usefulness. Therefore some anatomy curricular have included clinical case based anatomy teaching (1). Although the descriptive aspect of anatomy has to be taught in the initial stages, where students have to learn the basics of the structure of organs, the clinical aspects to bring out the importance of learning basic sciences at an early stage (2,3). This makes a rather boring subject much more interesting and

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applicable to the students' future learning years.

A debate exists between different groups as to which aspect should be assessed at exams. While certain groups stressed the importance of asking questions related to clinical knowledge, while others stressed that questions should focus more on descriptions of structures. It has been observed that students find descriptive types of questions much easier and they score more marks for such questions while questions based on clinical scenarios tend to be more difficult (perscomm). The objective of this study was to ascertain the first year students' perception of these different types of questions and to quantify the performance in each style of question.

METHODS

Students in the 1st year 2nd semesters at the Faculty of Medicine were recruited for the study. Participation was completely voluntary and no data was collected on those who refused to participate. The students were given a question paper that consisted of 2 different types of anatomy questions similar to the ones given during examinations and tutorials. The first question was a description of a structure where students had to describe the structure in detail, while the 2nd was a clinical case scenario where the students had to discuss the anatomical basis of a disease condition. The questions were given from an area which they had already studied.

Students were given 30 minutes to answer the two questions. Answer scripts were collected and marked by the principal investigator according to a predesigned marking scheme. Each student was given a score out of hundred. At the end of this session students were asked 3 questions regarding the two different types of questions that they had answered. The questions were; which type they thought was easy, which type they thought should be included in the assessments and which type they preferred to answer. They were also asked for, reasons for each preference.

RESULTS

All students in the batch present on the day of the study consented to participate. There were 192 students in the sample. All students had answered both questions. It was observed that the students had scored the high percentage of marks (73.4%) for the descriptive type of question and the lower percentage of marks for the clinical case scenario (65.7%) and there was a statistically significant difference between the two mean scores (Figure 1). It was interesting to see that 65.3% of students thought that the clinical case scenario type of question should be given for assessments while the rest were of the

opinion that descriptive type of questions should be included. The difference in the proportions was statistically significant. Of the students 58% said that they preferred to answer clinical case based type of question while 42% preferred the descriptive type (Figure 2). Here too the difference was statistically significant.

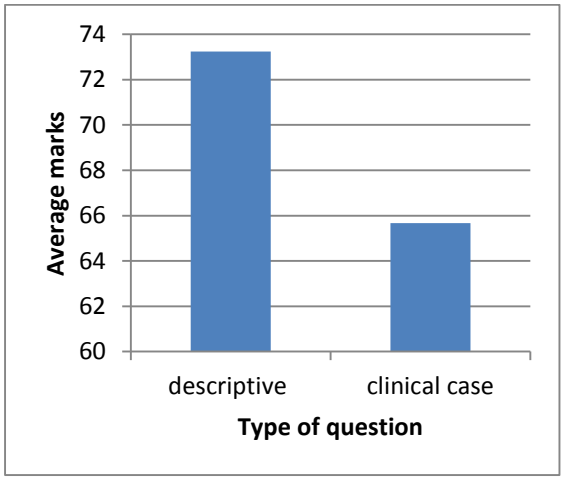

Figure 1. Average marks for each question (n=192)

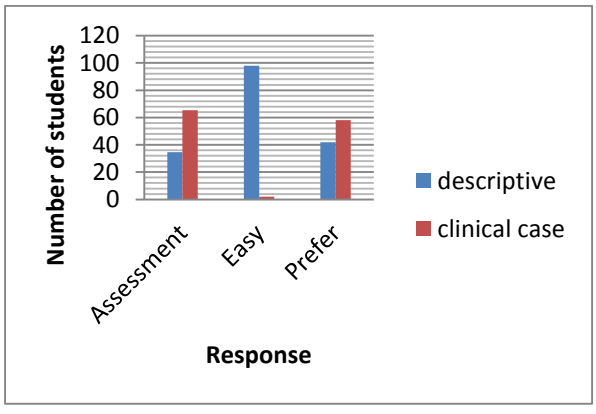

Figure 2. Student perception of the two different types of questions

DISCUSSION

Anatomy is mostly described as a basic science which is necessary for clinical practice (4,5). Students generally think that Anatomy is a subject which necessitates memorization of subject matter and reproduction of the same in the examination setting (6). However anatomy education is moving away from this traditional methods towards problem based curriculum with some resistance (7). With the change in curricula towards a more clinically orientated teaching method assessment needs to change parallel to this change. We designed our study in order to assess student performance and perception of clinical case based and descriptive type of questions.

As expected a majority of students scored highest marks in the descriptive type of question, while they scored less for the clinical cases. It was interesting to see that even though the students as an average had scored fewer marks for the clinical cases question, the majority thought this type of questions should be given for assessments. When asked why they thought so, the reasons a majority of them had stated was that they thought it would help them in their future years and also that such questions were much more interesting and challenging.

It is evident from these findings that even though students score better in descriptive

type of questions a majority think that clinical case based questions should be included in assessment and they prefer to answer such questions.

REFERENCES

1. Johnson EO, Charchanti AV, Troupis TG. Modernization of an anatomy class: From conceptualization to implementation. A case for integrated multimodal–multidisciplinary teaching. Ana ScieEdu 2012; 5:354-366.
2. Bethe A. Kritische, Betrachtungenu¨ber den vorklinischenUnterricht. [Critical observations on preclinical education].KlinischeWochenschrift 1928; 7:1481–1483.
3. Anderson J. The continuum of medical education: The role of basic medical sciences. J R Col of Physicians Lond1980; 27: 405–407.
4. Drake R. Meeting the challenge: the future of the anatomical sciences in medical school curricula. Anat Rec 2002;269:68.
5. Drake R, Lowrie D, Prewitt C. Survey of gross anatomy, microscopic anatomy, neuroscience, and embryology courses in medical school curricula in the United States. Anat Rec (New Anat), 2002;269: 118-122.
6. Miller SA, Perrotti W, Silverthorn DU, Dalley AF, Rarey KE. From college to clinic: reasoning over memorization is key for understanding anatomy. Anat Rec 2002;269: 69-80.
7. Colliver JA. Effectiveness of problem-based learning curricula: research and theory. Acad Med 2000;75: 259-266.

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Head Circumference as a Body Weight Predictor in a Group of Sri Lankan Adults

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ABSTRACT

***Introduction*:** Accurate estimation of the body weight (BW) increases the safety and effectiveness of medical and pharmacological interventions. However, various situations make it difficult or even impossible to obtain a patient's body weight. In those instances, the need for an alternate method of weight determination arises. Consequently, several studies have proposed obtaining BW through prediction formulas based on various anthropometric variables.

***Objective*:** Despite its' potential practical utility, little is known concerning the relationship between head circumference (HC) and BW among the adult Sri Lankans. The goal of this study was to propose population and gender specific regression formula for BW estimation using HC.

***Material & method*:** Body weight and HC was recorded in a total of 156 cadavers: male: n=74; female: n=82. Subjects with any craniofacial deformities or neurological disorders were excluded from the study.

***Results*:** The mean BW (kg) (male: 53.78 ± 14.14; female: 47.91 ± 7.26) and HC (cm) (male: 54.09 ± 3.28; female: 52.88 ± 2.83) of the study subjects were found to be significantly different ($P < 0.01$) between the genders. Correlation coefficient between the BW and HC was statistically significant and positive in both males (0.745) and females (0.365) indicating a strong relationship between the two parameters. Linear regression formulae for the prediction of BW using the HC were derived as follows: male: 31.27 + 1.57 (HC); female: 53.09 + 1.91 (HC).

Conclusion: Weight prediction equations that require a measuring tape as the only tool provides a practical alternative for the weight estimation of patients who are unable to walk due to various reasons. The use of anthropometric measurement such as HC is a simple, cost effective, non-invasive and objective method for BW prediction. Accurate prediction of a patient's weight will in turn, reduce potential drug

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dosing errors that may occur when weight is estimated only by visual observation in emergency situations. Complementary studies are necessary to evaluate the applicability of these equations in other age groups too.

Key words: Body weight, head circumference, Sri Lankans

INTRODUCTION

Body weight is an important anthropometric measurement in assessing nutritional status and the risk of cardiovascular disease and type 2 diabetes, predicting caloric expenditure and calculating body mass index of an individual (1,2). Body weight also forms the basis for calculating pharmacological doses of drugs or volume for resuscitation and pulmonary capacities in ventilated patients (1).

There are many instances where precise body weight of a patient is practically difficult or impossible to obtain using standardized methods. For example, in immobilized patients who are bedridden or in wheelchairs, in emergency setting when patients are unable to stand on a scale to be weighed accurately or clearly state their most recent weight due to altered mental status or some patients may simply do not know their own recent weight (3). Furthermore, scales integrated to hospital beds are not available in many health care institutions due to high cost. Consequently, various studies have proposed obtaining body weight through prediction formulas based on various anthropometric variables such as recumbent measures of arm and calf circumferences, triceps and subscapular skinfolds, knee height, abdominal circumference and cranial dimensions in different populations (3, 4,5). As the cranial dimensions are influenced by the race, sex and age of an individual, the need for race, age and sex specific formulae is also proved beyond doubt (6). It is important that predictive formulas are valid for a particular population in which they will be used so that the equations cover the characteristics of that population. Head circumference or the occipito-frontal circumference is the greatest of the cranial dimensions which passes around the forehead anteriorly and the external occipital

protuberance posteriorly (6,7). It is a routine part of the physical examination of a child and is of great importance in detecting abnormal patterns of growth (8).

Evidence shows a clear racial trend in the cranial dimensions and cephalic indices among different populations such as, Caucasians, Indians, Turkman and native Fars groups, Kosov and Albanians, Iranians, Japanese, Serbs, Greek, Bulgarians, Mapuche individuals in Chile, Nigerians, Caucasians and Sri Lankans (9,10,11, 12,13,14,15). Therefore, knowledge on the cranial morphometry is important in the study and comparison of the crania of populations from different racial, geographic and dietary backgrounds. Such information is also useful in studies of primate phylogeny. In clinical practice, population and age specific data on cranial dimensions gives an indication of the growth and development of an individual and also any abnormalities of cranial size and shape (8).

Despite its significance and potential practical utility, little is known concerning the relationship between head circumference and body weight among adult Sri Lankans. Therefore, the goal of this study was to propose population and gender specific regression formula for body weight estimation using the circumference of the head.

MATERIAL AND METHOD

This study was conducted on total of 156 cadavers donated to the Faculty of Medicine, University of Ruhuna, Sri Lanka. The subjects were apparently healthy and without any craniofacial deformities belonging to the same ethnic group. They were from different parts of the island belonging to different socio-economic status. The age of the subjects ranged from 55 - 89 years.

The body weight was recorded to the nearest 0.1 kg using a hanging balancer (Avery). Head circumference data were recorded as the maximum circumference of the head measured from just above the glabella to the area near the top of the occipital bone (opisthocranion) (6) using a flexible measuring tape capable of measuring to the nearest 0.1 cm. The above measurements were recorded at a fixed time between 14.00 – 16.30 hours to

eliminate discrepancies due to diurnal variation. All the measurements were repeated thrice and the mean was taken for further analysis. Furthermore, the measurements were recorded by the same person to minimize the errors in methodology.

Results were expressed as mean ± SD and analyzed using the Statistical Package for Social Sciences (SPSS), 15th version. A comparison of the mean values between the genders was performed using the t-test. P value < 0.01 was considered statistically significant. The strength of association between the head circumference and body weight was measured by the Pearsons correlation coefficient. Equations for weight estimation were obtained by linear regression analysis.

RESULTS

The mean ages of the study subjects (male: 75.49 ± 7.69; female: 74.66 ± 5.091) were not significantly different between the genders (Table I). Gender differences with respect to the head circumference and body weight was found to be significantly larger in males compared to females (P<0.01) (Table I, Figures 1a & 1b).

A linear regression analysis was performed for estimation of body weight using the head circumference as an independent variable. Pearsons correlation coefficient was used to examine the relationship between head circumference and body weight according to the gender. Correlation coefficient between the body weight and head circumference was found to be statistically significant and positive in both males (0.745) and females (0.365).

Scatter plots and linear regression lines demonstrating the relationship between body weight and head circumference are illustrated in Figures 2a, b & c. Linear regression formulae for the prediction of body weight using head circumference were derived as follows: male: 31.27 + 1.57 (HC); female: 53.09 + 1.91 (HC); both male and female (combined): 46.73 + 1.83 (HC)

Table I. Characteristics of the study subjects

Parameter	Female	Male	Both
Total Number	74	82	156
Age range (years)	68 – 83	55 – 89	55 - 89
Mean age (years)	74.66 ± 5.09	75.49 ± 7.69	75.10 ± 47.13
Body weight range (Kg)	30 – 57	34 – 93	30 - 93
Mean body weight (Kg)	47.91 ± 7.26 *	53.78 ± 14.14	50.99 ± 11.75
HC range (cm)	58.5 – 50	60 – 43.2	60 – 43.2
Mean HC (cm)	52.88 ± 2.83 *	54.09 ± 3.28	53.51 ± 3.13

* $P < 0.01$

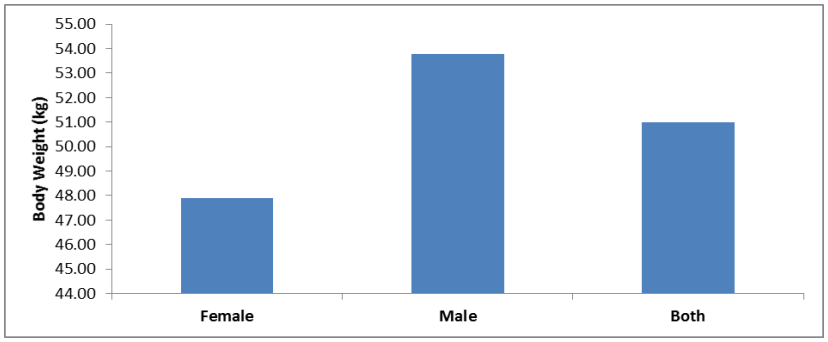

Figure 1a. Gender differences in body weight

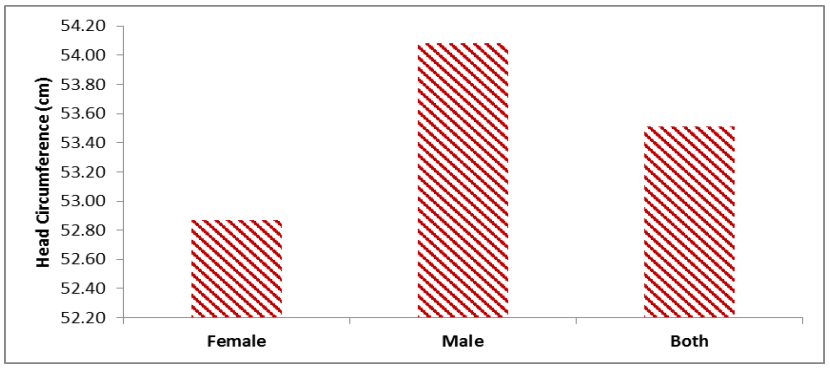

Figure 1b. Gender differences in head circumference

Figure 2a. Scatter plot and regression line demonstrating the relationship between body weight (kg) and head circumference (cm) in males

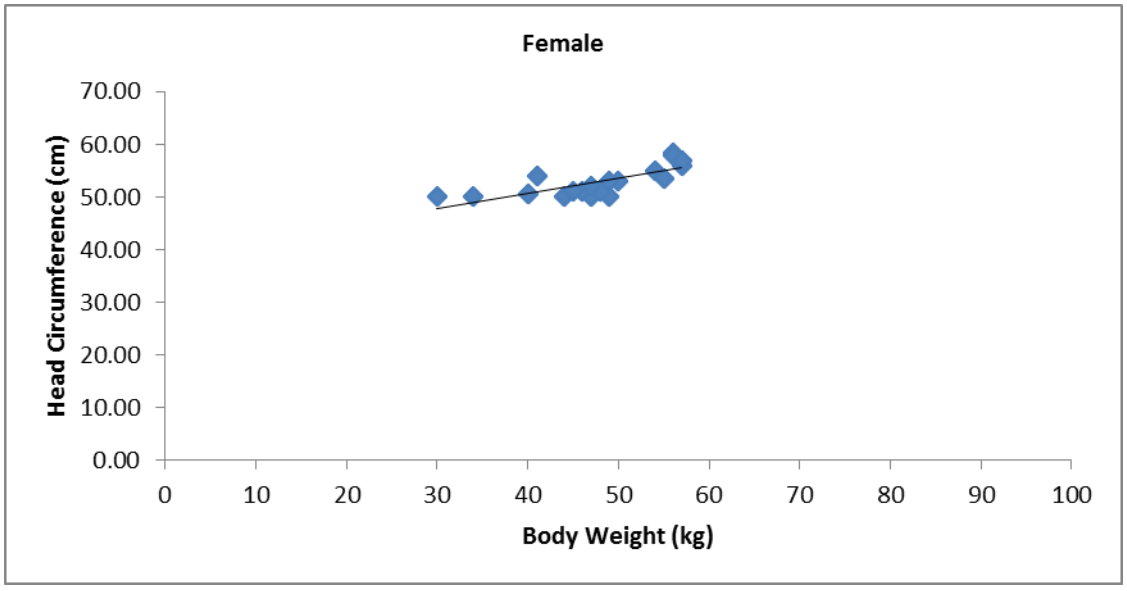

Figure 2b. Scatter plot and regression line demonstrating the relationship between body weight (kg) and head circumference (cm) in females

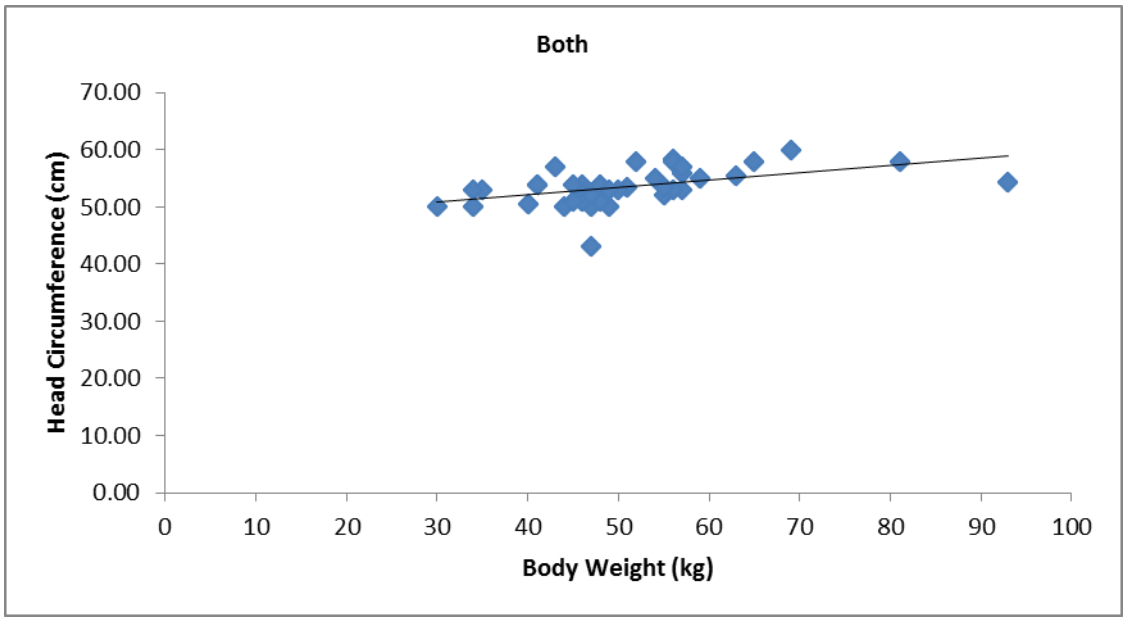

Figure 2c. Scatter plot and regression line demonstrating the relationship between body weight (kg) and head circumference (cm) in both males and females

DISCUSSION

The present study provides valuable data pertaining to the head circumference and its correlation with the body weight in an adult Sri Lankan population.

Several rare conditions have been identified where macrocephaly persists into adulthood: Cowden disease, tuberous sclerosis, neurofibromatosis type 1, Weaver syndrome, Sotos syndrome, autism spectrum disorder (16,17,18**)**. It was also important to note that adult patients with autism spectrum disorder displayed a statistically significant increase in head circumference relative to norms (18). Therefore, measurements of head circumference play a vital role in the diagnosis of such conditions in adulthood (19). In addition, some of these syndromes, like tuberous sclerosis and neurofibromatosis type 1 have an adulthood age of onset which further emphasizes the need for adult head circumference normative data (18**)**. Furthermore, it is stated that approximately 50% of normal head size variation is familial. Therefore adjustment of a child's head size value by the average parental value permits more refined assessment of head size when there is a suspected abnormality (19).

Variety of non-metric and metric parameters has been utilized in the assessment of ethnic and gender differences in cranio-facial morphology. The non-metric parameters are subjective as no quantitative techniques are devised. On the other hand, features that can be expressed as actual measurements, like head circumference, provide more objective racial and gender diversity assessment of the crania (5).

Diverse craniometric approaches have been utilized to estimate the cranial dimensions either on dry skulls, cadavers or living subjects. Over the course of this study head circumference was recorded using a flexible measuring tape. Cephalometry is reliable, relatively easy and quick to apply. This approach has the added advantage as it does not require any sophisticated techniques. Taken together, cephalometry continues to be the most versatile technique in the investigations of the craniofacial dimensions (21).

The gender divergence in head circumference observed in our study supports the previous observations (15). This further emphasizes the significance of applying the anatomical variation data to an individual subject in a given population. The need for the alternative formulae for the genders is also proved as the rate of skeletal maturity in males and females vary during the course of growth and development (6). Body weight of the subjects was significantly different between the genders. Correlation coefficients between the body weight and head circumference among adult Sri Lankans were found to be statistically significant and positive indicating a strong relationship between the two parameters. The correlation between HC and body weight could be a reflection of the bone mass and brain size as a heavier brain is likely to add to the individuals total body weight (18).

Variety of factors such as age, race, gender and nutritional status affect human development and growth. Therefore, different nomograms are required for different populations (6). The present study for the first time documents such norms for head circumference and presents gender specific linear regression models for weight prediction in an adult Sri Lankan population. These formulae are valid for the age group (55 – 89_years) of the subjects. It is widely accepted that cranial morphology varies with the age of an individual (22).

Accurate estimation of the body weight increases the safety and effectiveness of medical and pharmacological interventions. However, various situations make it difficult or even impossible to

obtain a patient's body weight and in those instances, the need for an alternate method of weight determination arises. The population, gender and age specific regression models proposed will be of practical use as facilities for weighing a patient in bed are not available in many health care institutions in the developing countries. Furthermore its applicability requires only a flexible measuring tape and the gender of the patient to estimate the body weight.

Alternate method to accurately predict a patient's weight, may in turn, reduce drug dosing errors that may occur when weight is estimated only by visual observation in emergency situations (4).

REFERENCES

1. Herout PM, Erstad BL. Medication errors involving continuously infused medications in a surgical intensive care unit. Crit Care Med 2004; 32: 428–32.
2. Bays HE, Chapman RH, Grandy S. The relationship of body mass index to diabetes mellitus, hypertension and dyslipidaemia: comparison of data from two national surveys. Int J Clin Prac 2007; 61: 737–747.
3. Rabito EI, Vannucchi GB, Suen VMM, Castilho N, Laércio L. Weight and height prediction of immobilized patients. Rev Nutr 2006; 19: 655-661.
4. Buckley RG, Stehman CR, Dos Santos FL, Riffenburgh RH, Swenson A, Mjos N, Brewer M, Mulligan S. Bedside method to estimate actual body weight in the Emergency Department. J Emerg Med 2012; 42: 100 –104.
5. Chumlea WC, Guo S, Roche AF, Steinbaugh ML. Prediction of body weight for the non-ambulatory elderly from anthropometry. J Am Diet Assoc 1988; 88: 564—568.
6. Krishan K. Estimation of stature from cephalo-facial anthropometry in north Indian Population. Foren Sci Int 2008; 181:521-6, 2008.
7. Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE. Gray's Anatomy: The anatomical basis of medicine and surgery. 38th edition. New York, Churchill Livingstone, 2000.
8. Harper C, Krill J, Raven D & Jones N. Intracranial cavity volumes: a new method and its potential applications. Neuropathol Appl Neurobiol 1984; 10: 25-32.
9. Abolhasanzadeh A & Farahani MR. Standarded international classification of head shapes of 22-24 years old in Tehran. J Res Med 2003; 26: 281-5.
10. Rexhepi A & Meka V. Cephalofacial morphological characteristics of Albanian Kosova population. Int J Morphol 2008; 26: 935-40.
11. Kasai K, Richards TC & Brown T. Comparative study of craniofacial morphology in Japanese and Australian aboriginal populations. Hum Biol 1993; 65: 821-34.
12. Obikili EN & Singh SP. Secular growth trend in the adult stature of Nigerians. Orient J Med 1992; 4: 44-47.
13. Del Sol M. Cephalic index in a group of Mapuche individuals in the IX region of Chile. Int J Morphol 2005; 23: 241-246.
14. Okupe RF, Coker OO & Gbajumo SA. Assessment of biparietal diameter during normal pregnancy in Nigerian women. Br J Obstet Gynaecol 1984; 99: 629-632.
15. Ilayperuma I. Evaluation of cephalic indices: a clue for racial and gender

diversity. Int J Morphol 2011; 29: 112-117.
16. Winter RM & Baraitser M. London dysmorphology database. Oxford, Oxford University Press, 1996.
17. Williams CA, Dagli A, Battaglia A. Genetic disorders associated with macrocephaly. Am J Med Genet 2008; 146: 2023-2037.
18. 18.Nguyen AKD, Simard-Meilleur AA, Berthiaume C, Godbout R, & Mottron L. Head Circumference in Canadian Male Adults: Development of a normalized chart. Int J Morphol 2012; 30: 1474-1480.
19. McCaffery P & Deutsch CK, Macrocephaly and the control of brain growth in autistic disorders. Prog Neurobiol 2005; 77: 38-56.
20. Weaver DD, Christian JC. Familial variation of head size and adjustment for parental head circumference. J Pediatr 1980; 96: 990-994.
21. Grant TM, Peter AM. Size and shape measurement in contemporary cephalimeyrics. Eur J Orthod 2003; 25: 231-242.
22. Wolf H, Kruggel F, Hensel A, Wahlund LO, Arendt T & Gertz HJ. The relationship between head size and intracranial volume in elderly subjects. Brain Res 2003; 23: 74-80.

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Occupational Eye Injuries; Are They Preventable?

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ABSTRACT

***Introduction*:** Ocular trauma at workplace is a worldwide cause of visual morbidity. It could be prevented by compliance to proper protective eyewear and increasing awareness. Preventive strategies can be best developed by analyzing the patterns and epidemiology of injuries. This study was designed to evaluate patterns and epidemiology of occupational eye injuries with a view to developing preventive strategies.

***Material and Methods*:** In this observational cross-sectional study, 152 ocular trauma patients presenting to Accident and Emergency service of National Eye Hospital, Colombo, Sri Lanka were enrolled. Data was obtained via an interviewer administered questionnaire and was analyzed by SPSS version 17.

***Results*:** Majority of the participants were aged 18-28years (50.7%). Males (96.1%) had the highest incidence of ocular injuries. Most of the patients were the sole breadwinner (84.2%) without life insurance (85.5%) or savings (62.5%) and are from low socioeconomic grounds (61.8%). The cornea (79.6%) was mostly affected; by superficial foreign bodies (62.5%) and by closed globe injury (99.3%).Greater number of ocular trauma was caused by physical means (75.7%) by sharp objects (67.8%). Majority of the participants 84.9% had not been using any eye protection at the time of injury. Protective eyewear was only provided at 44.7% of work places. Most of the patients attended the hospital 12-24 hours after (42.8%) ocular trauma. Out of the patients who presented to the hospital 77% were not given any first aid.

***Conclusion*:** Our results are comparable with those found in the literature. Promoting use of effective eye protection equipment and revision of the laws on occupational safety are some of the recommendations proposed to prevent occupational eye injuries.

INTRODUCTION

Ocular trauma at workplace is a worldwide cause of visual morbidity (1).

Consequences of occupational eye injuries are a cause of concern not only to the

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individual and the family but collectively will have an impact on the productivity and the economy of a country (2). Furthermore the incidence of work related eye injuries show an increase over the last few years in many developed countries (3). It could be prevented by compliance to proper protective eyewear and increasing awareness (4,5). Preventive strategies can be best developed by analyzing the patterns and epidemiology of injuries. This study was designed to evaluate patterns and epidemiology of occupational eye injuries with a view to developing preventive strategies in Sri Lanka.

METHODOLOGY

The study was an observational cross sectional study carried out at the Accident and Emergency Service of the National eye hospital Colombo, during August 2012. This study was approved by the Ethics Review Committee, Faculty of Medicine, University of Colombo and followed the tenets of the Declaration of Helsinki.

Data of 152 patients presenting with a history of occupational eye injuries were obtained by Interviewer administered questionnaires and hospital records.

Data was analyzed using SPSS 17.0 software.

RESULTS

Ocular injuries were highest among males (96.1%), the commonest age group affected was amongst 18-28years. Majority of the affected (61.2%) were educated up to O/L coming from an urban population (72.4%).

In considering the occupation of the affected population, welders (39.5%) were affected most and a considerable number affected were also handling chemicals (15.78%). Non-skilled (74.3%) work increased the risk for ocular injuries in comparison to skilled workers. Superficial foreign body was the commonest (62.5%) diagnosis. The cornea (79.6%) was the anatomical structure affected most with conjunctiva being the second commonest.

Greater number of ocular trauma was caused by physical means (75.7%) mainly by sharp objects (89.56%) and a lesser number caused by chemical injuries (23%) mainly in the form of liquids (82.85%)

Eye protection was not used by 84.9% of workers at the time of injury even though 38.2% of them had a history of previous eye trauma.

It was interesting to note that 15.1% acquired ocular injury while wearing goggles as eye protection.

Out of the work places 44.7% did not provide protective eyewear and 89.5% did not provide facilities to wash eyes.

Most of the patients (42.8%) presented to the hospital 12-24 hours after the incident, and 77% of them did not receive any first aid at the time of injury.

Occupational eye injuries indicated a considerable impact on the family economy as most of the patients were the sole breadwinner (84.2%) in low socioeconomic back ground with a monthly income of less than twenty five thousand rupees a month. (61.8%). Majority of the patients were not possessing any form of life or medical insurance (85.5%) or savings (62.5%).

CONCLUSIONS

Our results are comparable with those found in the literature (6,7). The population who suffer the most is young males who are the work force of the country. Welding is the commonest occupation leading to eye injuries despite repeated involvement. Non skilled work increases the risk. Cornea is the structure affected most, mainly via physical means. Frequent repeated ocular injuries are common at work place and it has a considerable impact on the family economy as well as the productivity of the work site. Majority does not use any eye protection during work and greater proportion of work places do not provide eye protection, or facilities to wash eyes in such ocular injuries as first aid.

RECOMMENDATIONS

At-risk population should receive increase attention in preventive strategies. Campaigns to increase awareness on occupational eye injuries among employees and employers are suggested with emphasis on the importance of early medical attention following ocular injury. Legislative implementations are recommended to prevent ocular injuries including, mandatory use of protective eye wear at work place.

Improving and maintaining standards and quality of eye protection wear is also important. To reduce the severity of ocular injuries first aid facilities should be readily available at close proximity to the work site to be utilized during an eye injury.

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REFERENCES

1. Thompson GJ, Mollan SP. Occupational eye injuries: a continuing problem. Occupational Medicine 2009; 59:123–125.
2. Ngondi CE, Chastonay P, Dosso A. Preventing occupational eye trauma (Geneva, Switzerland). J Fr Ophthalmol 2010 Jan; 33:44-9.
3. Chen SY, Fong PC, Lin SF, Chang CH, Chan CC. A case-crossover study on transient risk factors of work-related eye injuries. Occup Environ Med 2009 Aug; 66(8):517-22.
4. Blackburn J, Levitan EB, MacLennan PA, Owsley C, McGwin GJr. A case-crossover study of risk factors for occupational eye injuries. J Occup Environ Med. 2012 Jan; 54:42-7.
5. Hossain MM, Mohiuddin AA, Akhanda AH, Hossain MI, Islam MF, Akonjee AR, Ali M. Mymensingh. Pattern of ocular trauma. Med J .2011 Jul; 20:377-80.
6. Mansouri MR, Hosseini M, Mohebi M, Alipour F, Mehrdad R. Work-related eye injury: the main cause of ocular trauma in Iran.Eur J Ophthalmol 2010 Jul-Aug; 20:770-5.
7. McCall BP, Horwitz IB, Taylor OA. Occupational eye injury and risk reduction: Kentucky workers' compensation claim analysis 1994-2003.Inj Prev. 2009 Jun; 15:176-82.

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Comparison of Temperature Variations during Laparoscopic and Open Anterior Resections and Abdomino-perineal Resections

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ABSTRACT

Objective: To compare the incidence of hypothermia during open and laparoscopic colorectal surgeries.

Material and methods: A retrospective analysis of temperature variations of laparoscopic anterior resection and abdomino-perineal resections performed from January 2014 to April 2016 in the Professorial surgical unit at Teaching Hospital Peradeniya, Sri Lanka was evaluated. This was compared with that of open resections. ***Results:*** Thirty four patients were operated, twenty four patients being performed laparoscopically. The main temperature drop occurred soon after induction of anaesthesia, measured 15minutes after induction. The mean drop in laparoscopic group is 1.39 and 1.6 in open group. The drop in open group is higher which was statistically significant with a p value of 0.001. The fluctuations each hour subsequently were less and temperature gains were noted in some hours in both groups which. The total drop at end of procedure was 1.04 in laparoscopy group and 2.19 in open group. The difference was statistically significant with a p value of 0.05.

Conclusions: The temperature drop in open surgery group is higher than laparoscopic surgery group performed for carcinoma of rectum.

Key words: Hypothermia, Anterior resection, Abdomino-perineal resection

INTRODUCTION

Hypothermia is a complication of prolonged surgery (1,2,3,4,5,6,16). General anaesthesia, gas insufflation during minimal access surgeries, use of irrigation fluids, exposure of body cavities during open surgery and prolonged operating times contribute to hypothermia (2,4,5). Hypothermia leads to an increase in systemic vascular resistance due to vasoconstriction and possible altered organ perfusion and a shift in the oxyhemoglobin dissociation curve to the left. These can cause tissue hypoxaemia. Cardiac

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arrhythmias, coagulation abnormalities, altered drug metabolism, and increased metabolic demands during re warming are reported due to hypothermia. A higher incidence of post-operative wound infection is also documented (8). Animal experiments have shown evidence for enhanced tumour growth attributed to hypothermia during laparoscopic procedures (7).

Warming of patient, use of warmed irrigation fluids and warmed intravenous infusions have shown to reduce the incidence of per operative hypothermia (1, 2, 5).

Anterior resection (AR) and abdomino-perineal resection (APR), which are the surgical treatment for carcinoma of rectum, may cause hypothermia by being prolonged procedures.

The current trend is to perform both procedures laparoscopically due to associated lower morbidity compared to open surgery (9,10,11,12,13,14). The incidence of hypothermia has been demonstrated to be same during open and laparoscopic colorectal surgeries, in published data (14,15,16).

OBJECTIVE

To compare temperature variations of open vs laproscopic AR and APR performed in our unit.

PATIENTS AND METHOD

A retrospective analysis of temperature variations of laparoscopic anterior resection and abdomino-perineal resections performed from January 2014 to April 2016 was evaluated. This was compared with that of open resections.

The following parameters were recorded.

1. Duration of surgery
2. Body temperature.
3. Gas insufflation volume
4. IV fluids

Warming devices were used and IV fluids were warmed. CO2 used to create pneumoperitoneum and, irrigation fluids were not warmed. The temperature was recorded by naso-pharyngeal probe.

RESULTS

Thirty four patients were operated. Twenty four patients underwent laparoscopic procedure. There were twenty anterior resections and four abdomino-perineal resections in the laparoscopy group.

Ten patients underwent open surgery which included six anterior resections and four abdomino-perineal resections.

The mean oral temperature recorded in ward was 370C.

The mean volume of intravenous fluid infusion ranged from 150ml/ hour for laparoscopy and 250ml/hour for open surgery. Volume of gas insufflated ranged

from 50-100 litres per hour for laparoscopy. None required blood transfusions. The mean volume of irrigation fluid used in laparoscopy was 30ml/hour. The average operating time of AR was 210min and for APR 180min.

Table 1. Mean temperature drop

Time from start of procedure	**Mean change of temperature (Celsius) from previous value**		
	Laparoscopic		Open
15 min after induction of GA	Minus 1.39	Minus 1.6	Minus 1.6
1 hour	Plus 0.29	Minus 0.5	Minus 0.5
2 hours	Plus 0.1	0	0
3 hours	Plus 0.02	Plus 0.03	Plus 0.03
4 hours	Minus 0.05	Minus 0.1	Minus 0.1
Total drop at end of surgery	Minus 1.04	Minus 2.19	Minus 2.19

DISCUSSION

Hypothermia is a known complication of major abdominal operations. (1,2,3,4,5,6,16). There are reports showing no difference of the incidence of hypothermia in open and laparoscopy (14,15,16).

In our series the main temperature drop occurs soon after induction of anaesthesia, measured 15minutes after induction. Temperature drop after induction of anaesthesia is a known phenomenon and is due to many factors such as vasodilatation and effects on the thermoregulatory centre. The mean drop in laparoscopic group is 1.39 and 1.6 in open group. The drop in open group is higher which was statistically significant with a p value of 0.001.The fluctuations each hour subsequently was less and temperature gains were noted in some hours in both groups which is expected with thermoregulatory mechanisms being operational. The total drop at end of procedure was 1.04 in laparoscopy group and 2.19 in open group. The difference was statistically significant with a p value of 0. The higher drop in the open group

may be explained by exposure of body cavity and intestines to exterior with greater heat loss.

However in both groups none of the patients dropped their temperature below 34.5, the defined level of hypothermia.

Using warming of patient, use of warmed irrigation fluids and warmed intravenous infusions have shown to reduce the incidence of per operative hypothermia (1,2,5,7). We used patient warming and warmed intravenous infusions during this study. In laparoscopy using warmed irrigation may have helped to further minimize temperature drop.

CONCLUSIONS

The temperature drop in open surgery group is higher than laparoscopic surgery group performed for carcinoma of rectum in this study. Use of warming devices and use of warmed intravenous fluids helps to minimize temperature drop.

REFERENCE

1. Bush HL, Hydo LJ, Fischer E, Fantini GA, Silane MF, Barie PS. Hypothermia during elective abdominal aortic aneurysm repair: The high price of avoidable morbidity Journal of Vascular Surgery 1995;21; 392–402.
2. Leben J, Tryba M. Prevention of Hypothermia during Surgery Contribution of Convective Heating System and Warm Infusion Annals of the New York Academy of Sciences Thermoregulation: Tenth International Symposium on the Pharmacology of Thermoregulation pages 1997;813; 807–811
3. Kurz A, Daniel I, Sessler, Narzt E, Bekar A, Lenhardt R , Huemer G, Lackner F Postoperative hemodynamic and thermoregulatory consequences of intraoperative core hypothermia Journal of Clinical Anesthesia 1995;7 359–366.
4. Nduke CC, Puttick M, Coated P, Yong L, Peck D, Darzi A. Intraperitoneal hypothermia during surgery enhances post operative tumor growth Surg Endos 2002:16;611-615.
5. Kurz A, Sessler DI, Lenhardt R. Perioperative normothermia to reduce the incidence of surgical wound infection and shorten hospitalization The New England Journal of Medicine1996;334:1209-1215.
6. Redwine DB, Sharpe DR. Laparoscopic segmental resection of the sigmoid colon for endometriosis. J laparoendoscopic Surg 1991; 1:217-20.
7. Monson JR, Hill AD, Darzi A. Laparoscopic colonic surgery British Journal of Surgery 1995;82:150-7.
8. Decanini C, Milson JW, Bohm B, Fazio VW. Laparoscopic oncologic abdomino-perineal resection. Dis Colon Rectum 1994;37:552-8.
9. Ziprin P, Ridgway PF, Peck DH, Darzi AW. The theories and realities of port site metastases: a critical appraisal. J Am Coll Surg 2002; 195:395-498.
10. Stocchi L, Nelson H, Young-fadok TM et al. Safety and advantages of laparoscoic vs open colectomy in the elderly, matched control study. Dis Colon rectum 2000; 43:326-32.
11. Danelli G, Berti M, Perotti V. et. al, Temperature control and recovery of bowel function after laparoscopic or laparotomic colorectal surgery in patients receiving combined epidural / general anaesthesia and postoperative analgesia. Anaesth Analg 2002;95:467-71.
12. Stewart BT, Stitz RW, Tuch MM, Lumley JW. Hypothermia in open and laparoscopic colorectal surgery. Diseases of the colon and rectum 1999; 42:1292-95.
13. AJ, Moyes D, Maddern GJ, Hewett PJ. Core temperature changes during open and laparoscopic colorectal surgery Surgical Endoscopy 1999; 13:480-83.

14. H L Bush, L J Hydo, E Fischer,GA Fantini, M F Silane, P S. Barie,Hypothermia during elective abdominal aortic aneurysm repair: The high price of avoidable morbidity Journal of Vascular Surgery 1995;21; 392–402

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Impact of Crash Characteristics, Safety Accessories on Injury Patterns among Motorcycle Users Attending Teaching Hospital, Karapitiya, Galle

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ABSTRACT

Introduction: Road traffic accidents involving motor cycles often results in severe morbidity and mortality. There has been a significant increase in incidences of motorcycle accidents in Sri Lanka in the recent past. This study was conducted to understand the different factors related to the motor cycles, users and the roads which determine the injury patterns on victims, who were presented to the Teaching Hospital, Karapitiya, Sri Lanka.

Methods: This prospective analytical study was carried out among the motor cycle users admitted during the six months from January 2015.

Results: A total of 272 patients (233 males) ranging in age from 6 months to 73 years (mean = 30 years) were included. Out of all patients 194 (71.3%) were riders. About 50.7% of the incidents happened during the daytime. Majority of patients had ridden classical motor cycles (66.2%) and 56.6% of all bicycles had a crash bar. About 9.9% of the victims were wearing full face helmets whereas 11.4% were without helmets. It is recorded that 51.5% of the incidents occurred in urban areas and 91.2% of accidents were on tarred roads. Majority incidences (82.4%) happened when it was not raining. Abrasions were the commonest (69.5%) injury and 47.1% of patients had injuries which fell in to Grievous Hurt Category according to the Penal Code of Sri Lanka. Wearing helmets is a protective factor from head injuries (p=0.020). Full face helmets provided protection from facial injuries than partial coverage helmets (p=0.037). ***Conclusions:*** Motor cycle users sustain different types of injuries and majority was Grievous Hurt category. Wearing helmets is a protective factor from head injuries andfull face helmets provided protection from facial injuries than normal helmets.

Keywords**:** motorcycle, injuries, accidents

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INTRODUCTION

Motor cycles are a common mode of transport in Sri Lanka especially among low middle class population due to their affordable price, fast and ease of use and ability to beat traffic jams in urban areas. It constitutes the largest proportion of vehicles which involves in the traffic accidents in Sri Lanka and in recent years there has been a significant increase in mortality and morbidity. According to the Sri Lanka Police traffic statistics 16240 motor cycles involved in traffic accidents in 2010 (1).

According to the World Health Organization report, in 2002 traffic related injuries killed around 1.2 million people and injured more than 50 million others (2). An analysis of motor vehicle crash related deaths indicate that over 40% of victims are motorized two-wheeled users (3,4). Despite of all these established facts, motor cycle is used as a mean of transportation is on the rise worldwide (5).

Many recent reports indicate that motorcycle accident (MCA) victims are young males (6,7) and the head injuries and lower extremity injuries accounted for the major proportion of injuries sustained by motor cycle users (6,7,8,9). The head injuries are attributed to the low use of safety helmets; a situation seen in many developing countries (10). The instability of the motorized two wheeled vehicle, the attitudes of the riders and the factors related to the poor conditions of the roads are the major causes for traffic accidents. The injury patterns depends on the speed of the vehicle, crash characteristics, usage of safety measurements mainly helmets, type of post-crash event etc. It is a universally accepted fact that the usage of helmets protects against head injuries, but it has been argued that motorcycle helmet use decreases rider vision and increases neck injuries (11).

This descriptive cross sectional study was carried out to determine crash characteristics, environmental factors injury patterns and impact of safety measures on the severity of injuries among motorcycle users (MCUs) attending the Teaching Hospital, Karapitiya, Galle.

OBJECTIVES

The general objective of this study was to understand the different factors related to the motor cycle, road and the rider which determines the injury patterns on motor cycle users in traffic accidents. The specific objectives were to determine the relationship of the injury pattern of motor cycle users with the type of the motor cycle, different

safety mechanisms available in the motor cycle and used by the motor cycle users,

conditions of the road and the crash characteristics.

STUDY DESIGN & METHODOLOGY

This descriptive cross-sectional study was carried out at the Teaching Hospital, Karapitiya which is the major tertiary health care institution in the Southern Province of Sri Lanka. The Judicial Medical Officers' (JMOs') Office at the Teaching Hospital, Karapitiya (THK) examines about 10000 patients annually with different medico legal issues such as injuries following traffic accidents, assaults, abuse etc.

The study team analysed 272 MCUs admitted to the Emergency Trauma Centre (ETC) at the THK following traffic accidents during the period of six months from January 2015. All the MCUs who were examined by the authors during the medico legal examination were included in the study. The patients were selected from the history given by the patient and confirmed from the Hospital Police Post records. Each MCU was interviewed and examined after obtaining consent to determine the age, gender, types of injuries, the category of hurt, type of the motor cycle,

crash characteristics, different safety accessories used by the MCU and was available on motor cycles. The type of the injury and the severity of the injuries were determined from the examination findings, considering the radiographic images and after referring the medical records.

DATA ANALYSIS

Interpretation of the findings was done after careful and complete consideration of all circumstances**.** Frequencies mean (SD) was employed in the analysis was done using SPSS V.17. Results were considered significant at $p = 0.05$.

ETHICAL CONSIDERATION

The study was carried out after obtaining the ethical clearance from the Ethical Review Committee, Faculty of Medicine, Galle. The permission was obtained from the Director of the THK to carry out the study on patients in the hospital.

RESULTS

A total of 272 MCUs were included in the study. Out of the total, 233(85.6%) were males and 39 were females (14.4%). The age of the MCUs were ranging from 6 months to 73 years (mean = 30 years).The peak incidence was 21-40 years (152 patients, 55.6%) followed by 0-20 years (65patients, 23.9%) (Table 01).

Out of the total, 194 (71.3%) were riders. According to the results of this study the number of motor cycle accidents distributed throughout the 24 hours. But the highest number of incidence (58,

21.3%) happened during 0.00 – 04.00 hrs. and the lowest number of incidence (35, 12.9%) happened during 20.00 – 23.00 hour (Table 02). Almost equal numbers of incidences happened during day time and night time which are 134(49.3%) and 138(51.7%) respectively (Fig. 1)

While 51.5% of the incidents occurred in urban areas the rest occurred in the suburban or rural areas. While 248(91.2%) accidents were on tarred roads, 10(3.7%) were on concrete roads (Table 03). Majority incidences (82.4%) happened when it was not raining. While 157(57.7%) motor cycles collided with another vehicle, 115(42.3%) sustained injuries due to various other reasons such as impact with a stationary object, slipping on the road and loss of control or while trying to save a stray dog on the road. The type of motor cycles involved in the accidents were classical motor cycles 180 (66.2%), scooters 74 (27.2%), and light mopeds 15 (5.5%).

When analyzing the different safety accessories available in motor cycles, 154(56.6%) had crash bars. Different safety accessories used by the MCUs were considered in this study. The safety helmets were categorized into 2 groups. Those were full coverage/face helmets and the partial coverage helmets. Out of the total 241(88.6%) were wearing safety helmets, Out of which 27(9.9%) were wearing full face helmets and 214 were wearing partial coverage helmets (Table 5). Out of the total, 207(85.9%) have fasten the chin strap while the rest 34(14.1%) either have not fasten or chin straps were absent. Two MCUs were wearing jackets and gloves.

Different injuries were observed on the MCUs considered in the study. Out of the total number of patients, abrasions were present on 189(69.5%) followed by fracture in 123(45.2%), lacerations in 109(40.1%), contusions in 60(22.1%), cuts in 5(1.8%), and burns in (20.7%) respectively. When the distribution of injuries on the body was considered 106(39%) suffered facial injuries and 46(16.9%) MCUs had head injuries. There were neck injuries on 10(3.7%) victims and 2(0.7%) sustained injuries on genitalia. When the injuries on the extremities were concerned, 147MCUs sustained upper limb injuries and 149 sustained lower limb injuries. Standard statistical tests were used to compare groups and to determine the statistical significance of the association between variables. Wearing helmets were statistically significant protection for a head injuries compared to the MCUs without helmets (p=0.020). Full face helmets provided statistically significant protection from facial injuries than partial coverage helmets (p=0.037).After the

medico legal examination of the patients the injuries were categorized according to the Hurt described in the Penal Code of Sri Lanka. Majority 128(47.1%) of the victims sustained injuries which amounts to 'Grievous Hurt' (GH) followed by 114(41.9%) which were 'Non Grievous Hurt'(NGH). Life threatening categories of hurt were observed in 30 (11%) victims (Table 06).

DISCUSSION

This study was undertaken 272 MCUs who were admitted to the hospital with injuries following traffic accidents. It was observed that the majority of the victims were young males with mean age of 30 years which agrees with similar type of studies done overseas (6,10,11,12).The motorized two-wheeled vehicle is a very unstable and the users are at a risk of sustaining injuries. This study shows that among the users, the riders account for majority injury patterns and agrees with other similar studies (11,13,14,15). This finding suggests that riders constitute the majority among the MCU victims reporting to hospitals.

It is a well-known fact that the incidences of traffic accidents are higher during the peak hours of the day, but this study indicates that the incidence of motor cycle accidents are more or less equal during the 24 hours of the day with highest incidence (21.3%) occurred during early hours of the day. The reasons may be due to the higher speed on empty roads, consumption of alcohol by the rider and the poor lightening systems which we were unable to asses.

In this study we have observed 2 crash characteristics. One was due to the collision with another vehicle. The other one was accidents on the road due to the reasons such as while trying to avoid a stray dog on the road, due to loss of control or due to the classical "slide and fall" mechanism. This shows how motor cycle users are vulnerable to other vehicles even without impact with other vehicles.

According to the Road Development Authority of Sri Lanka, there are different categories of roads(16).The majority of the MCA occur on the carpeted or tarred roads (Category A, B, C) in urban areas during non-rainy times. Different types of motor cycles are used on roads in Sri Lanka. The classical motor cycles involved in major proportion of MCA and this study indicates that the crash bars which is a safety mechanism available on the motor cycle does not significantly protect the user from sustaining injuries.

A main objective of this study was to identify the impact of using safety helmets in MCA. It seems intuitive that the helmets would protect the user against head injuries but it has been argued that the

using of helmets decrease rider`s vision and increases neck injuries (17). Beginning from 1985 it is mandatory to wear safety helmets for all motor cycle users in Sri Lanka. Although it is a common knowledge that the helmet usage is low in developing countries average rate of using safety helmets in Sri Lanka is 81%(13,15,18). The above findings confirm from our study where 88% were using a safety helmet. Most of the victims who do not use helmets were children. The helmet usage among children is as low as 20%(18).These findings justify the need for designing a special message for the children who use motor cycles as a mean of transportation to increase their awareness of the dangers of motor cycle use in the absence of protective measures.

Abrasions were the commonest type of injury followed by the fractures which is consistent with other similar studies. Abrasion is the most superficial injury which caused by a blunt force and can sustain during the primary impact of the anatomical area of the victim with the projecting part of the other vehicle or an object or due to the impact with the ground (19). According to the Penal Code of Sri Lanka, majority of the injuries were categorized as either Grievous Hurt or Non Grievous Hurt and there was 11% of life threatening injuries (20). The face and the extremities were the most vulnerable anatomical areas for injuries. Previous studies have shown that head and the extremity injuries are the commonest causes for morbidity and the mortality in MCA (10). This study indicates that the 55.0% MCUs had head and facial injuries. Wearing helmets is a protective factor from head injuries (p=0.020). Full face helmets provided protection from facial injuries than partial coverage helmets (p=0.037).

CONCLUSIONS:

Young male motor cycle riders constitute the majority among the MCU victims reported to the hospital. This study revealed that the MCAs occur around 24 hours of the day on urban areas. Abrasions and the fractures were the commonest types of the injuries present on the face and extremities. Most of the injuries present on the victims were Grievous Hurt according to the Penal Code of Sri Lanka which implies the severity of the injuries. Therefore it is recommended that the legislative efforts should be taken to promote safety gears used by MCUs and implement necessary rules to reduce the MCAs.

Table 1. Age groups

Age	Frequency	Percentage
0-20	65	23.9
21-40	152	55.9
41-60	47	17.3
above 61	8	2.9
Total	272	100.0

Table 2. Time of incident

Time	Frequency	Percentage
0.00-4.00	58	21.3
4.01-8.00	45	16.5
8.01-12.00	44	16.2
12.01-16.00	44	16.2
16.01-20.00	46	16.9
20.01-23.59	35	12.9
Total	272	100.0

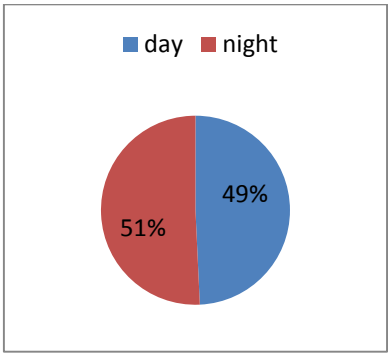

Figure 1. Time of incident

Table 3. Road conditions

Road type	Frequency	Percentage
Tarred	248	91.2
Concrete	10	3.7
Sand	3	1.1
Mud	2	0.7
Marsh	3	1.1
Gravel	6	2.2
Total	272	100.0

Table 4. Type of motor cycle

	Frequency	Percentage
Classical	180	66.2
Scooter	74	27.2
Moped	15	5.5
Other (trail bike etc.)	3	1.1
Total	272	100.0

Table 5. Use of different types of safety helmets

	Frequency	Percentage
Full face	27	9.9
Partial cover	214	78.7
No helmet	31	11.4
Total	272	100.0

Table 6. Category of Hurt

	Frequency	Percentage
EL	15	5.5
FIOCN	15	5.5
GH	128	47.1
NGH	114	41.9
Total	272	100.0

REFERENCES

1. Official Web Site of Sri Lanka Police Department. www.police.gov.lk. Web site accessed on 5 March 2017.
2. Peden M, ScurfiEld R, Sleet D, et al. World Report on road traffic injury prevention. Geneva: World Health Organization; 2004.
3. Santamariña-Rubio E, Pérez K, Ricart I, Arroyo A, Castellà J, Borrell C. Injury.profiles of road traffic deaths. Accid Anal Prev 2007. Website. Accessed on 10 October 2016.
4. Beck LF, Dellinger AM, O'Neil ME. Motor vehicle crash injury rates by mode of travel, United States: using exposure-based methods to quantify differences. Am J Epidemiol. 2007; Website Accessed on 5 August 2016.
5. Keall MD, Newstead S. Analysis of factors that increase motorcycle rider risk compared to car driver risk. Accid Anal Prev. 2012; Website. Accessed on 10 October 2016.
6. Lateef F. Riding motorcycles: Is it a lower limb hazard? Singapore Med J. 2002.
7. Zargar M, Khaji A, Karbakhsh M. Pattern of motorcycle-related injuries in Tehran, 1999 to 2000: a study in 6 hospitals. East Mediterr Health J. 2006;12(1–2):81
8. Pan Afr Med J. 2014 Nov 17;19:296. doi: 10.11604/pamj.2014.19.296.4885. Collection 2014.
9. Sisimwo PK., Mwaniki PK., Bii C. Inj Prev. Crash characteristics and injury patterns among commercial motorcycle users attending Kitale level IV District Hospital, Kenya. 2006 Aug; 12(4): 266–268. doi: 10.1136/ip.2005.011221.
10. Solagberu BA, Ofoegbu CKP, Nasir AA, Ogundipe UK., Adekanye AO, and Abdur-Rahman LO..Motorcycle injuries in a developing country and the vulnerability of riders, passengers, and pedestrians.BMC Public Health. 2015; 15: 915.Published online 2015 Sep 18. doi: 10.1186/s12889-015-2290-4.
11. Alain C, Julius A, Jean GT, Clovis F and Marcelin N, A prospective pilot cohort analysis of crash characteristics and pattern of injuries in riders and pillion passengers involved in motorcycle crashes in an urban area in Cameroon: lessons for prevention., ochraneDatabaseSyst Rev. 2008 Jan 23;(1):CD004333.
12. Leijdesdorff HA, Siegerink B, Sier CF, Reurings MC, Schipper IB. Injury pattern, injury severity, and mortality in 33,495 hospital-admitted victims of motorized two-wheeled vehicle crashes in The Netherlands. J Trauma Acute Care Surg 2012; 72:1363-8.
13. Odelowo EOO. Pattern of trauma resulting from motorcycle accidents in Nigerians: a two-year prospective study. Afr J Med Med Sci 1994 23:109–112.
14. Adegbehingbe BO, Oluwadiya KS, Adegbehingbe OO. Motorcycle associated ocular injuries in Ile-Ife, Nigeria. African Journal of Trauma 2004;235–39.
15. Oluwadiya K.S, Oginni IM, Olasinde A A *et al*, Motorcycle limb injuries in a developing country. West Afr J Med 2004; 23: 42–46.46 Web site accessed on 01.04.2017.
16. Official Website of Road Development Authority.www.rda.gov.lk Web site accessed on 05th March 2017.
17. Liu BC, Ivers R, Norton R, Boufous S, Blows S, Lo SK.. Helmets for

preventing injury in motorcycle riders.ochrane Database Syst Rev. 2008 23;:CD004333. doi: 10.1002/14651858.CD004333.
18. Ranaweera PSPA, Department of Civil Engineering, University of Moratuwa. Electronic Thesis and Dissertation 2014. Web site accessed on 04.04.2017.
19. Pekka S, Knight B, Forensic Pathology 3nd Edition. Arnold Lond. 2004 Edward Arnold (Publishers) Ltd. Pp. 136 – 143.
20. Penal Code of Sri Lanka. Government of Ceylon Legislative Enactments 1970.

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A Study on Child Sexual Abuse in Galle – A Descriptive Retrospective Study

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ABSTRACT

Introduction: The estimation of any form of deviance in the general population is a very difficult task. It is impossible to assess the extent of sexual offending, either in general or with children as targets. Therefore an in depth study should be conducted to explore the real situation.

Objective: Routine data pertaining to victims of alleged child sexual abuse (CSA) were analyzed to explain the nature and characteristics of people, place, time, and patterns of CSA with special reference to injuries.

Materials and Methods: All the CSA cases referred to the JMO's office, Teaching hospital, Karapitiya form 1st April 2013 to 31st March 2015 were retrospectively analyzed.

Results: During the study period, 296 victims were referred, 281 were female. 210 (70%) were between 11 to 15 years and majority (88%) were belonging to lower socio-economic classes. 173 (59%) female victims "consented" for the alleged act whereas none of the male victims did. Majority of female sexual abuse offenders were aged below 25 years whereas for male, aged above 35 years ($p>0.05$). Ano-genital injuries in female victims at presentation is more frequent compared to male victims ($p>0.05$). 116(41%) female victims had hymenal tears, out of that, only 18 are fresh tears. 14 victims complained of alleged anal abuse but only 2 had identifiable injuries. Extra genital injuries were present only in female victims (1.5%). Only 57(20%) presented with original clothing & only 20(6.7%) presented within first 24 hours. Spermatozoa were identified only in 6 referred cases to government analyst.

Conclusions: Children below 16 years of age from lower socio-economic group were more prone to sexual abuse. The given "consent" and delayed presentation could be a reason for lack of injuries in both groups. Young males have shown preference for female victims whereas older males have shown preference for younger boys. Low positive spermatozoa identification could be due to delayed presentation & baths and changing clothes prior to referral. Steps needed to be taken to speed up the referral of victims with their original clothing in order to prevent loss of valuable evidence.

Key words: child sexual abuse, Galle, ano-genital injuries, hymenal tears.

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INTRODUCTION

The term "child" is used to refer to anyone under the age of 18 years. Although child sexual abuse (CSA) is recognized as a serious violation of human well-being and of the law, no community has yet developed mechanisms that ensure that none of their youth will be sexually abused. CSA is, sadly, an international problem of great magnitude that can affect children of all ages, sexes, races, ethnicities, and socioeconomic classes.

Until recently, there was much disagreement as to what should be included in the definition of CSA (1). In some definitions, only contact abuse was included, such as penetration, fondling, kissing, and touching (2). Noncontact sexual abuse, such as exhibitionism and voyeurism, were not always considered abusive. Nowadays, the field is evolving towards a more inclusive understanding of CSA that is broadly defined as any sexual activity perpetrated against a minor by threat, force, intimidation, or manipulation. The array of sexual activities thus includes fondling, inviting a child to touch or be touched sexually, intercourse, rape, incest, sodomy, exhibitionism, involving a child in prostitution or pornography, or online child luring by cyber predators (3,4).

Only recently, in our country, the sexual abuse of children has come to be seen as a major social problem and a main cause of suffering of many people. A study conducted in the early 1990s among 899 pre-university and undergraduate students in Sri Lanka revealed that 18% of boys and 4.5% of girls had been sexually abused in childhood4. Some believe that, for the first time in history, we are beginning to face the true prevalence and significance of child sexual abuse. Others worry that many people have become obsessed with child sexual abuse and deny any personal responsibility for their problems while "blaming" them on abuse and bad parenting.

OBJECTIVE

Objective in this study was to explain the nature and characteristics of people, place, time, and patterns of child sexual abuse with special reference to injuries, to identify the consequences of child sexual abuse and to identify factors important for policy making for solving the problem of child sexual abuse.

MATERIALS AND METHODS

All the child sexual abuse cases referred to the JMO’s office, teaching hospital, Karapitiya, Galle, form 1st of April 2013 to 31st of March 2015 were retrospectively

analyzed. As the primary source, medico-legal examination forms (MLEF) of all the child sexual abuse victims were used and as secondary sources, bed head tickets and other relevant medical reports were used. The medico legal records of 296child sexual abuse cases were evaluated and routine data were analyzed by using Microsoft Excel and SPSS software.

The different types of assault were defined as penetration (with penis, hand, or foreign object) vaginal, oral, anal or a combination of the three, alternatively others when no penetration was involved but other kinds of touching or kissing had occurred (involving genitals or body parts). Violence was defined as hitting, kicking, holding, attempts of strangulation, or by other means. Genital injuries were defined when swelling (oedematous tissues), redness (erythemous skin), ecchymoses (skin or mucous membrane discolorations, known as bruising), tears (breaks in tissue including fissures, cracks, cuts and lacerations), and several (more than one of the above mentioned injuries) were observed. The different genital injury locations are defined as vulva, introitus, labia minora, posterior fourchette, hymen, and vagina.

RESULTS

During the study period, 296 victims were referred for medico-legal examination with an alleged history of sexual abuse and out of that 281(94%) were female. The age of the victims ranged from 4 years to 18 years (Table 1). 210 (70%) victims were between 11 to 15 years of age. Out of the female victims 231(80%) were found to have attained menarche at the time of sexual abuse.

Majority (40%) of the victims were referred after 72 hours of the alleged incident (Table 2).

The alleged incident had taken place at the victims' house in 128 (43%) cases (Table 3).

Majority of the victims were abused by a single assailant 286 (98%) (Table 4) and the assailant was known in 279 (95%) cases. The alleged assailant (Table 5) was a boyfriend in majority of female sexual abuse cases (54%) where as in male sexual abuse cases it was a known neighbor (2.7%). Six female victims were found to be living together with their boyfriends at the time of police intervention.

Assailants were aged from 17 to 64 years (Table 6). There was a statistically significant difference (p value < 0.05) in relation to the age of the offenders. Majority of female sexual abuse offenders were aged below 25 years (80%) whereas

male sexual abuse offenders were aged above 35 years (3.7%).

The commonest type of alleged abuse in female victims was vaginal intercourse where as in males it was intercrural intercourse (Table 7). 173(59%) female victims and 04(1.3%) male victims found to have given "consent" for the alleged act (table 08).

After the alleged abuse, 225 female victims and 12 male victims found to have changed their clothes prior to examination by a doctor (Table 9).

21 female victims and 03 male victims had a past history of alleged sexual abuse. 42 female victims found to have had "consented" sexual intercourse during the past. Majority (88%) of the victims were belonging to lower socio-economic classes where as 10% to middle classes and only 2% to higher classes. 256 (86%) had not studied beyond grade 10.

Majority of victims found to be living with their parents (37%) in their own houses (73%).

Annular hymen 138 (49%) was the commonest type of hymen found among the femal victims followed by fimbriated 87(31%) and cresentic 46(16%) (Table 10).

There was a statistically significant difference in relation to presence of ano-genital injuries (p value < 0.05). Female victims were found to have presented with ano-genital injuries more frequently (67%) in comparison to male victims (6%) (Table 11). Out of the female victims only 18 (6%) had fresh tears (Table 12).

6 o clock was the commonest place for hymenal tear followed by 9 o clock and 3 o clock (Table 13).

Only the female victims found to have extra genital injuries and they were present only in 4 (1.5%) cases. All the victims with extra genital injuries were abused by unknown offenders. Abrasion was the commonest type of injury found and the face was the commonest place injured followed by upper limbs and lower limbs.

Pregnancy test was performed on 38 female victims and it was positive on three. Swabs for spermatozoa were collected on 245 victims and it was positive only on 6 female victims. None of the male victims had positive results. All victims were referred for sexually transmitted infection screening and 18 female victims and one male victim had positive results. All victims were referred to psychiatrist and 37 female and 4 male victims found to have some form of mental health issues. 161 female victims were referred to obstetrician and out of that 3 were confirmed to be pregnant. Six victims were referred to radiologist for age assessment.

Table 1. Age of the victims

	Male	Female
Age (years)	No:	No:
01 – 05	01 (0.3%)	08 (2.7%)
06 – 10	09 (3.0%)	27 (9.1%)
11 – 15	05 (1.6%)	205 (69%)
16 – 18	00	41 (13%)

Table 2. Time gap

Time gap	No:
< 06 hours	03 (1%)
06 – 24 hours	17 (5.7 %)
24 – 48 hours	49 (16 %)
48 – 72 hours	107 (36 %)
> 72 hours	120 (40 %)

Table 3. Place of the alleged incident

	Male	Female
Place	No:	No:
Victims home	03 (1%)	125 (42%)
Assailants home	06 (2%)	39 (13%)
Deserted place	02 (0.6 %)	18 (5.7%)
Temple/mosque/church	04 (1.3 %)	02 (0.6%)
Hotel/guest house	---	38 (13 %)
Friends home	---	10 (03%)
Relatives home	---	29 (10%)
Neighbors' home	---	30 (8%)
School	---	02 (0.6%)
Film hall	---	03 (1%)

Table 4. No of assailants

	Male	Female
No of assailants	No:	No:
01	11 (3.7%)	275 (94%)
02	02 (0.6%)	04 (1.3%)
> 02	02 (0.6%)	02 (0.6%)

Table 5. Alleged assailant

	Male	Female
Assailant	No:	No:
Relative	02 (0.6%)	14 (4.8%)
Neighbor	08 (2.7%)	28 (9.6%)
Priest	04 (1.3%)	02 (0.6%)
Boyfriend	---	160 (54%)
Teacher	---	02 (0.6%)
Father	---	10 (8%)
Any other	---	49 (17 %)
Unknown	01 (0.3%)	16(5.4%)

Table 6. Age of the assailant

	Male	Female
Age of the assailant	No:	No:
> 15	00	00
16 – 20	01 (0.3%)	86 (29%)
21 – 25	02 (0.6%)	148 (51%)
26 – 30	01 (0.3%)	19 (6.5%)
31 – 35	00	07 (2.4%)
36 – 40	07 (2.4%)	08 (2.7 %)
41 – 45	03 (1%)	06 (2%)
46 – 50	01 (0.3%)	04 (1.3%)
51 – 55	00	02 (0.6%)
56 – 60	00	01 (0.3%)

Table 7. Type of abuse

	Male	Female
Type of abuse	No:	No:
Fondling	06	87
Intercrural intercourse	11	37
Anal intercourse	04	07
Kissing	--	178
Oral intercourse	--	65
Vaginal intercourse	--	197
Exhibitionism	--	05
Combination	08	169

Table 8. In obtaining consent

	Male	Female
In obtaining consent	No:	No:
Use of threat	14 (4.8%)	73 (25%)
Hurt	03 (0.6%)	06 (2%)
Fear of death	--	24 (8%)
Detention	--	--
Unsound mind	--	05 (1.7%)
Intoxication	--	02 (0.6%)
"Consented"	--	173 (60%)

Table 9. Following alleged abuse

	Male	Female
Following abuse	No:	No:
Change clothes	09	225
Wash / Bath	12	191
Urinate	12	262
Defecate	07	178
Brush teeth	11	243
Rinse mouth	11	256
Use of tampon or pads	--	14
Vomit	--	02

Table 10. Type of hymen

Type of hymen	No:
Annular	138 (49%)
Fimbriated	87 (31%)
Crecentic	46 (16%)
Septate	02 (0.7%)
Attenuated	08 (3%)

Table 11. Type of injury

	Male	Female
Type of injury	No:	No:
Anal injuries	01	01
Hyenal tears	--	116
Reddening of hymen	--	25
Fourcheette tear	--	31
Dilated hemenal orifice	--	71
Loss of vaginal rugae	--	61
Reddening of Labia	--	16
Combination	--	131
No injuries	14	33

Table 12. Type of hymenal tear

Type of tear	No:
Fresh	18
Partially healed	13
Old healed	85

Table 13. Position of the hemenal tear

Place	No:
3 o clock	47
5 o clock	27
6 o clock	83
7 o clock	14
9 o clock	56
12 o clock	08
Combination	93

DISCUSSION

Sexual assaults by strangers have been reported as more violent and associated with more injuries than assaults by a person known to the victim (5, 6, 7, 8, 9). This is in keeping with findings of this study as all the victims who had extra genital injuries been abused by an unknown person.

The victim's relationship to the assailant is consistent with earlier international studies and the majority of all assaults were committed by a person known to the victim (10,11).

Sexual assaults committed by an unknown person comprise 5.7% in this study population, which is somewhat lower when compared with studies from the United Kingdom and the United States (5,12). Our results, establishing that only a minority of sexual assault victims have clinical evidence of fresh genital injuries, are supported by previous studies (6,10, 12). The genitoanal area has a remarkable healing capacity resulting in injuries disappearing quickly. One of the most important factors in the forensic examination is therefore the time lapse between the sexual assault and the examination. An examination after 72 hours will not show minor lacerations that might have been present earlier.

This study has some limitations and strengths that need to be mentioned. The study is retrospective, and the choice of variables was limited. Data collection was dependent on victim's report, and it is not clear how reliable it is to collect data within the context of a forensic examination shortly after a sexual assault because of peri traumatic dissociation. Some children did not recall or were unwilling to relate assault details. Data were collected from one hospital that in most cases probably would reduce generalizability, but as all sexual assault victim care in the Galle district are centralized to one unit, these are the circumstances that give strength to the study.

CONCLUSIONS

Children below 16 years of age from lower socio-economic group were more prone to sexual abuse. As they were below 16 years, this had amounted to statutory rape. The given "consent" and delayed presentation could be a reason for lack of injuries in both groups. A statistically significant difference was noted in relation to the age of the offenders. Young males have shown preference for female victims whereas older males have shown preference for younger boys. Low positive spermatozoa identification results could be due to delayed presentation and victims taking baths and changing clothes prior to referral. Steps needed to be taken to speed up the referral of victims with their original clothing in order to prevent loss of valuable evidence.

REFERENCES

1. Tharp AT, De Gue S, Valle LA, Brookmeyer KA, Massetti GMA, Systematic Qualitative Review of Risk and Protective Factors for Sexual Violence Perpetration. Trauma, violence and abuse. Published online on 27 December 2012. Available at http://tva.sagepub.com/content/early/2012/12/27/1524838012470031.
2. Black, MC, Basile, KC, Breiding, MJ, Smith, SG, Walters ML, Merrick MT,

Chen J, Stevens MR. (2011). The National Intimate Partner and Sexual Violence Survey (NISVS): 2010 Summary Report. Atlanta, GA: Centers for Disease Control and Prevention.

3. Möller AS, Bäckström T, Söndergaard HP, Helström L. Patterns of Injury and Reported Violence Depending on Relationship to Assailant in Female Swedish Sexual Assault Victims. Journal of Interpersonal Violence: 27: 3131–3148.
4. From a study by Professor H. de Silva. As quoted in second country report on the implementation of the convention on the rights of the child. Department of Probation and Childcare Services, Ministry of Social Services. 1998.
5. Jones JS, Wynn BN, Kroeze, B, Dunnuck C, Rossman L. (2004). Comparison of sexual assaults by strangers versus known assailants in a community-based population. American Journal of Emergency Medicine, 22, 454-459.
6. Palmer CM, McNulty AM, Déste C, Donovan B. (2004). Genital injuries in women reporting sexual assault. Sex Health, 1, 55-59.
7. Slaughter L, & Brown CR. (1997). Patterns of genital injury in female sexual assault victims. American Journal of Obstetrics & Gynecology, 176, 609-616.
8. Stermac LE, Du Mont JA, Kalemba, V. (1995). Comparison of sexual assaults by strangers and known assailants in an urban population of women. Canadian Medical Association Journal, 153, 1089-1094.
9. Sugar N F, Fine DN, Eckert LO. (2004). Physical injury after sexual assault: Findings of large case series. American Journal of Obstetrics & Gynecology, 190, 71-76.
10. Grossin C, Sibille I, Lorin de la Grandmaison G, Banasr A, Brion F, Durigon M. (2003). Analysis of 418 cases of sexual assault. Forensic Science International, 131, 125-130.
11. Logan TK, Cole J, Capillo A. (2007). Differential characteristics of intimate partner: Acquaintance, and stranger rape survivors examined by a sexual assault nurse examiner. Journal of Interpersonal Violence, 22, 1066-1076.
12. Maguire W, Goodall E, Moore T. (2009). Injury in adult female sexual assault complainants and related factors. European Journal of Obstetrics & Gynecology and Reproductive Biology, 42, 149-153.

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Splenic Morphometry in a Group of Sri Lankan Adult Population – A Preliminary Cadaveric Study

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ABSTRACT

Introduction: A detailed knowledge on morphometric variations of the spleen is of great value in diagnosing splenomegaly clinically, radiologically and for surgical procedures.

Objectives: This study was undertaken to establish splenic morphometry in a group of Sri Lankan adults.

Methodology: Splenic morphology was noted and maximum length, thickness, width were recorded (n=30) using a vernier caliper (Tricebrand) with minimum measurement of 0.001cm. The weight was measured with a manual triple beam balance (up to 0.1g). Splenic index (width x length x thickness) and splenic volume (0.524 x splenic index) were calculated. Cadavers with history of haemopoetic or reticular endothelial disorders, ruptured, grossly adhered spleens were excluded from the study. Results were expressed as mean ± SD.

Results: Out of the total spleens, 43.3% were semilunar, 33.3% wedge, 10% oval, 3.3% tetrahedral, 6.6% polygonal wedge shaped and 3.3% single lobed liver shaped. Notches were absent in 16.67% and when notches are present they are exclusively in the superior border. Single notch was present in 26.7%. Out of single notches, 30% were posterior pole notches. More than one notch was present in 46.7% and the 81.8% of those were in the anterior pole. Mean length, width and thickness were 8.06cm ± 1.66, 7.65cm ± 1.05 and 5.33cm ± 0.89 respectively. Splenic index was 174.67. Splenic volume and weight were 91.52 $cm^3$and 80.13g± 35.84 respectively.

Conclusion: This pilot study reveals that the splenic morphology is in par with other populations and bipolar length of the spleen has strong positive correlation with the volume. Large scale study is recommended to establish population specific data base.

Key words: spleen, morphometry

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INTRODUCTION

Spleen is the largest lymphoid organ of the body, found in the left upper quadrant of the abdomen beneath the diaphragm, adjacent to 9^{th}, 10^{th} and 11^{th} ribs, oriented along the long axis of the 10^{th} rib (1). William's *et al.* described the spleens wedge to tetrahedral in shape with two surfaces; diaphragmatic and visceral. There are two borders; superior, inferior and anterior, posterior extremities. Upper and lower poles are described as posterior and anterior extremities (2).

Sinnathambi *et al.* stated that the splenic statistics can be visualized in odd numbers; size measures 1 x 3 x 5 inches, weight 7 oz (3). William's *et al.* described the adult spleen; usually about 12cm long, 7cm broad, 3-4 cm wide and weighs about 150g (normal range 80- 300g) (2). Embryologically spleen develops from the dorsal mesogastrium, initially as few splenic nodules, which subsequently fuse to form the spleen proper. As a result of rotation of the stomach, it takes the position of left hypochondrium

between two leaves of the dorsal mesogastrium (4,5).

Spleen has both immunological and haematological functions, in which the white and red pulp serves important roles. Precisely, the white pulp stores B and T lymphocytes while the red pulp is an important site for extra medullary erythropoiesis acting as a blood filter for foreign material and damaged blood cells (4).

Spleen is frequently subjected to routine splenic surgeries and also a potential site of life threatening hemorrhages in trauma leading to emergency splenic explorations. Splenic surgeries vary from open total/ partial splenectomy to laparoscopic splenectomy, where the knowledge of splenic anatomy and surgical techniques are imperative for good results (5).

This organ is involved with a wide variety of congenital and acquired disease conditions, thus frequently been subjected to radiological assessments. Having a sound knowledge on detailed splenic morphology and morphometry is of value as it prevents misinterpreting normal splenic variations as pathologies.

Establishment of normative measurements, normal morphology and its variations is required to fulfill the above needs. The present preliminary study is aimed at evaluating the normal morphometry of the spleen in a Sri Lankan adult population and is fully justified due to scarcity of such information for this population.

MATERIALS AND METHOD

This cross sectional observational study was conducted in the department of

Anatomy, University of Ruhuna, from June 2016 to August 2016, using thirty (n=30), male and female cadaveric spleens (age range 20- 80 years). These cadavers were stored in 10% formalin filled tanks following embalming according to the standard procedure by injecting 10% formalin based preservative. Identification details and past medical history were available in record. Any cadaver with a history of haemopoetic or reticular endothelial disorder, ruptured or grossly adhered spleens were excluded from the study. Eight (n=08) spleens were excluded due to above reasons.

The external appearances of the spleens were observed and photographed using a13 mega pixel digital camera. Splenic shapes were recorded (semilunar, wedge, tetrahedral, polygonal wedge, single lobed liver shape). Location and number of splenic notches were recorded with regard to the superior or inferior border of the spleen (i.e. superior border separates the diaphragmatic surface from the gastric impression and inferior border separates the renal impression from the diaphragmatic surface) and with regards to the upper and lower poles (2). The morphology compatible with the standard textbook description was considered as the normal morphology (2)(3). Any abnormal morphology was recorded and photographed.

Measurement procedures

Maximum upper to lower pole length, breadth and thickness of the spleens were recorded in centimeters, using a Tricebrand Vernier caliper with accuracy up to 0.001cm. The weight was recorded using a manual three beam balance, with accuracy up to 0.1g. The splenic index was calculated; maximum length x width x thickness. The volume of spleen was calculated by using the standard clinical prolate ellipsoid equation for spleen [0.524 × splenic index] (8,9).

Mean and the standard deviations of the splenic length, thickness, volume, and weight were calculated. The association between the splenic parameters (length and volume) was evaluated using Pearson correlation coefficient.

RESULTS

In the present study mean length, width, thickness and the weight of the spleen were 8.06 ± 1.66cm, 5.71 ± 1.05cm and 3.56 ± 0.89cm and 80.13 ± 35.84g respectively (Table 1). Out of the total spleens, thirteen (43.3%) were semi lunar shape, ten (33.3%) wedge, three (10%) oval, one (3.3%) tetrahedral shaped, two (6.6%) polygonal wedge and one (3.3%) was single lobed liver shaped (Figures 1 &2). Notches were absent in five spleens (16.67%). The notches were exclusively observed in the superior border. Single

notch was seen in eight spleens (26.7%) and 30% were in upper pole (posterior extremity) notches. More than one notch was present in fourteen spleens (46.7%) and 81.8% were in the upper pole. Maximum number of splenic notches observed was four (Table 2). Mean splenic volume and splenic index were 91.52 ± 45.67cm^3 and 174.67 ± 87.17 respectively.

Table 1: Mean length, width, thickness and weight and standard deviation of the spleens

	Mean	Standard deviation
Length	8.06 cm	1.66
Width	5.71 cm	1.05
Thickness	3.56 cm	0.89
Weight	80.13 g	35.84

Table 2: Number of splenic notches and their distribution in upper and lower poles

Number of notches	Percentage	Location of notches	Percentage
Absent	16.6%	NA	NA
Single notch	26.7%	Upper pole	30%
		Lower pole	70%
More than one notch	46.7%	Upper pole	81.1%
		Lower pole	19.9%

(NA- Not applicable)

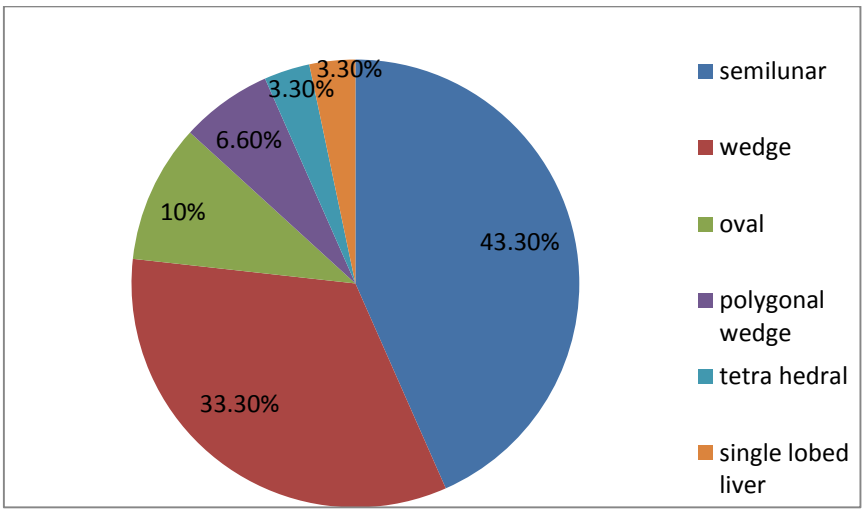

Figure 1. Splenic shapes

A. Semi lunar Shape

B. Oval shape

C. Wedge shape

D. Liver shape

E. Polygonal wedge

F. Tetrahedral shape

Figure 2 (A-F). Splenic shapes

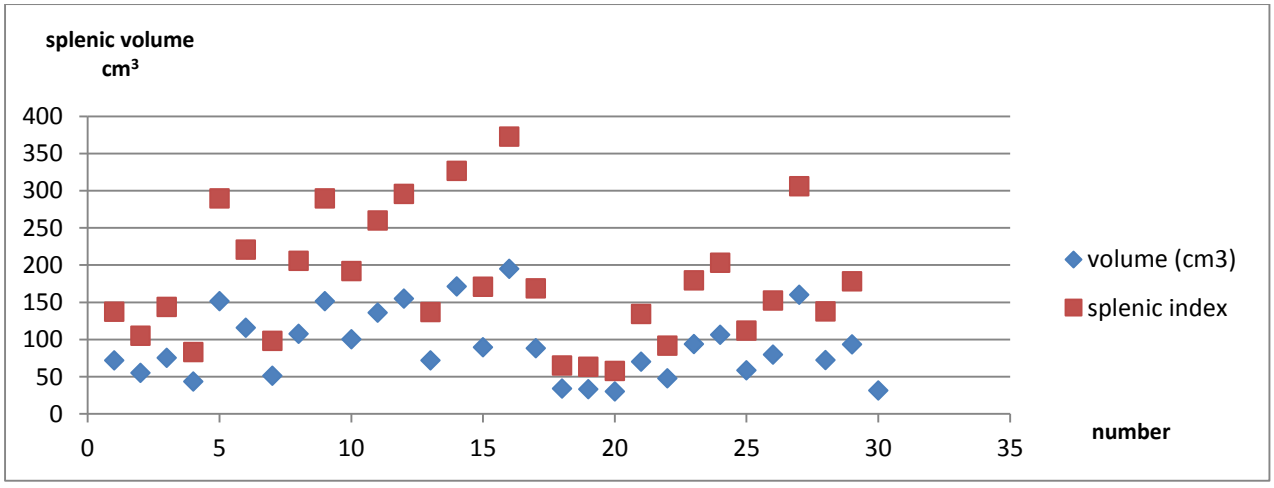

Figure 3. Distribution of the splenic volume and the index

Figure 4. Splenic notches in superior surface of the spleen

A strong positive correlation was identified with the splenic length and the volume (r- 0.8393 and r^2 - 0.7044, P < 0.00001, is significant at p < 0.01) (Fig: 5).

Splenic thickness was weakly but positively correlated to the splenic volume(r- 0.1947 and r^2- 0.0379, P < 0.29391) (Fig: 6). A moderately positive correlation was noted between splenic width and volume

(r- 0.7384, r^2 - 0.5452 and P < 0.00001).

A strong positive correlation was observed between the splenic volume and the weight (r - 0.9044, r^2 - 0.8179).

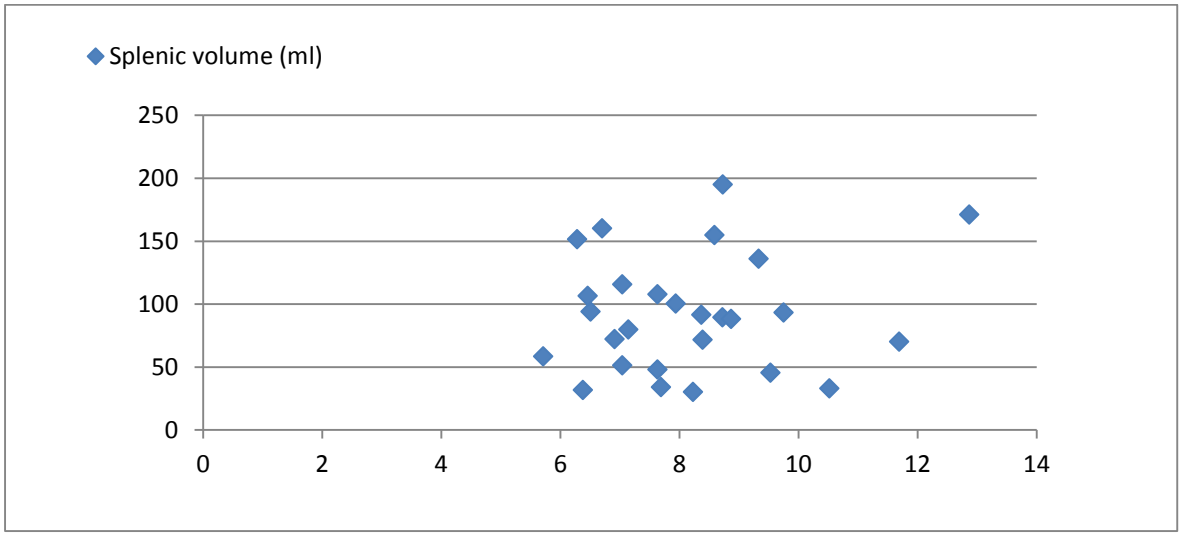

Figure 5. Correlation between splenic volume and splenic length

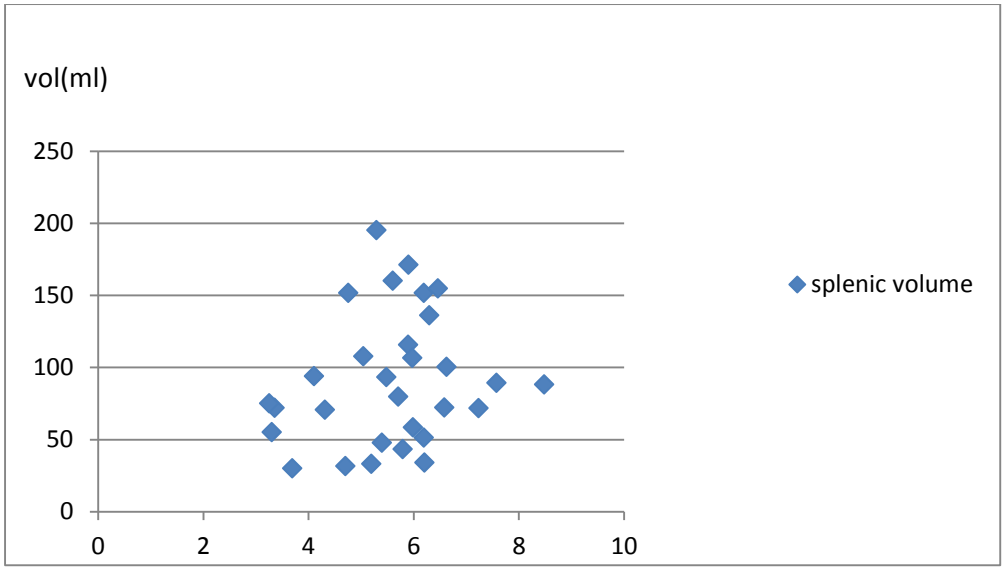

Figure 6. Correlation between the splenic volume and splenic thickness

DISCUSSION

Splenomegaly and small sized spleens are seen in a wide variety of clinical conditions. Palpation methods are widely used to diagnose splenomegaly. Napoli *et al.* stated, that precise estimation of the pre-operative splenic volume is important in laparoscopic splenectomy (6). The mean volume of the spleen in African adults is smaller than the available data from Western sources, which cannot be explained by differences in body habitus (7). Therefore, population specific data is important in clinical diagnosis of splenomegaly and to diagnose small contracted spleens. Present study provides valuable detailed splenic morphometric analysis for Sri Lankan adults.

The observations from the present study reconfirm wedge shape as the commonest shape (12,13). In our study, the wedge shape was closely followed by semi lunar shape, which is not a commonly described shape in other populations.

Location of the splenic notch was compared with the other available data. Das *et al. and* Girish *et al.* (14,15) described 98% and 95%, respectively of superior border notches in their studies, while we found 100% superior border notches. Therefore, Sri Lankan splenic morphology described in this study is compatible with other populations.

Though the mean splenic weight established was80.13g±35.84 g, a wide variation was noted in splenic weight among the study population (range 25.8 - 151.5g). This wide variation was true for the splenic volume as well, mean 91.53 cm^3 ± 45.67, range 30.24 - 195.23 cm^3.

This type of wide variation has been observed in other populations as well (8), which can be due to variations in patient height. Adil Asghar *et al.* stated that there is a significant correlation between patient height, surface area and the splenic volume with $r = 0.521$, $p<0.05$(9). Therefore, it is highly recommended to establish normative measurements of the spleen, not only for the age but also for the height as well.

A strong positive relationship was established with splenic length vs. splenic volume and with splenic weight vs. volume. A moderate positive correlation was established with splenic width vs. Splenic volume. Therefore, ultra-sound scan time can be markedly reduced by measuring only bipolar splenic length, which is technically fast and accurate compared to the measurement of the splenic width and the thickness. Width of the spleen can be measured in borderline cases to confirm splenomegaly.

LIMITATIONS

Main limitation of this study is the small sample size, which directly affects the generalization of our estimation. Additionally, this study was done with formalin preserved cadaveric spleen, without giving allowances for the shrinkage. To overcome these problems, it is recommended to use large unpreserved samples to establish population specific morphometry of the spleen.

CONCLUSION

In real time ultra sound scan evaluation of the splenic size, it is time saving to measure only the bipolar length to predict the true volume and weight. Splenic width can be taken into consideration when findings are marginal or inconclusive.

Population specific splenic measurements should be established using a large sample according to the age as well as the height.

REFERENCES

1. Snell RS. Clinical Anatomy by regions. Lippincott Williams & Wilkins, 2013.
2. William's et.al, 8th edition. Gray's anatomy.
3. Sinnathamby CS. Last's Anatomy. Elsevier, 2011.
4. de Porto AP NA, Lammers AJJ, Bennink RJ, et.al. Assessment of splenic functions. Eur J Clin Microbiol Infect Dis, 2010, 29: 1465-1473.
5. Panagiotis N, Skandalakis, et.al, Surgical Anatomy of the spleen. Surgical Anatomy and embryology: 747-768.
6. Napoli A, Catalano C, Silecchia G et al. Laparoscopic splenectomy: multidetector row CT for preoperative evaluation. 2004, Radiology; 232: 361-367.
7. Mustapha Z, Tahir A, Tukur M, Bukar M, Lee WK. Sonographic determination of normal spleen size in an adult African population. 2010, Eur J Radiol; 75:864-872.
8. Siddiqui MA, Hassan AA, Bedewi MA.et. al. Estimation of standard splenic volume in Saudi Arabian adult population: Using 3D reconstruction of abdominal CT scans. 2014, Open Journal of Internal Medicine: 421-425.
9. AdilAsghar D, Agrawal SM, Yunus et al.Standard splenic volume estimation in North Indian adult population: Using 3D

reconstruction of abdominal CT scan images. 2011, Anatomy Research International;332-333.
10. T.W.Sadler. Digestive system. Langman's Medical Embryology. 2010.
11. Chaware PN, Belsare SM, Kulkarni YR. Morphological variations of the human spleen. 2013, Int J Bio Med Res; 4: 3464-8.
12. Das S, Latiff ABD et al. Anomalous splenic notches: A cadaveric study with clinical importance. 2008: 232-241.
13. Study of splenic notches in a human cadaver. Garish VP, Shishikumar et al. 2014, International Journal in Recent Advances in Multidiciplinary Research, 66-72.
14. Pansky B. The Foregut: The Pancreas and Spleen. Review of Medical Embryology.
15. Estimating splenic volume. Ellen MY, Katrina BA, Mary C, Olson et.al. 2003, American Journal of Radiology, 181:1615-1620.
16. Hollinshed WH, Anatomy for surgeons. 1982: 877-885.

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Room Temperature Resin Casting Technique, A Low Cost and Effective Teaching Tool in Human Anatomy

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ABSTRACT

***Objectives*:** To develop a cost effective optimal technique to preserve human tissues in a manner that detailed anatomy and almost all relevant properties are retained.

***Methods*:** The study was done in the department of Anatomy, Faculty of Medical Sciences, University of Sri Jayewardenepura. The tissues are initially preserved using formalin to stop the decaying since soft tissues are subjected to rapid decomposition. The water content is significantly removed using series of 99.9% pure acetone baths while maintaining the original tissue architecture. Dehydrated tissue part is embedded in a degassed clear liquid resin after mixing with the catalyst, which will polymerized into a solid resin cast.

***Results*:** In this invention, dehydrated human tissues, while preserving the original shape and volume are embedded in a clear synthetic resin cast. Follow up has been done over 3 years to date. No significance change has occurred in preserved specimens were observed. This is an appropriate method for preserving human body cross-sections at specific vertebral levels. The specimens are more durable than other specimen preservation methods used in Sri Lanka, tissue waste is minimum and there by the cost of preservation and maintenance of cadavers are reduced drastically. Currently these resin casts are used for teaching/learning activities in department of Aanatomy, FMS, USJP.

***Conclusions*:** Undoubtedly the detailed anatomy is best learned by cadaver dissections. But resin casting is a highly successful, cost effective supplementary method of teaching/learning gross and cross sectional Anatomy with no exposure to formalin.

Key words: tissue preservation, resin cast

INTRODUCTION

Anatomy is a key subject in medical undergraduate and postgraduate curriculum. Traditionally gross anatomy has been taught in medical schools with cadaver dissections. Dissection of cadavers provides student with the unique perception of details of human

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anatomy that is thought to facilitate understanding of complex anatomy of human body (1). Due to the immense difficulty in obtaining cadavers to the Medical schools, to reduce the cost involved in cadaver preservation and maintenance and also due to the recognized health hazards of exposure to the formalin (the usual preservative of cadavers), the medical faculties are considering novel teaching/learning tools of anatomy (2). Advance imaging facilities as 3D CT reconstructions and high resolution cadaveric CT scans are some newest modalities in teaching anatomy (3). Computer assisted teaching methods (4), plastinized specimens (5), plastic mannequins and formalin mounted specimens and prosected specimens (6) are some such teaching/learning tools used in Sri Lanka. Also with the frequent usage of imaging techniques in diagnoses it is essential that the medical students need to have a clear knowledge of cross sectional anatomy. Traditionally anatomy has been taught on a regional basis. However cross-sectional anatomy is routinely encountered by clinicians. With the advent of modern medical imaging, more and more cross-sectional images of human anatomy are available as teaching material for modern day students.

Can we improve spatial understanding of anatomy and imaging by exposing students to cadaveric cross-sectional specimens? We attempted to answer this question in a carefully designed case control study.

As a solution we at Department of Anatomy, Faculty of Medical Sciences (FMS), University of Sri Jayewardenepura (USJP) has invented a method of mounting considerably anhydrous human tissues in a solid resin casts, to study detailed Anatomy including cross sectional Anatomy. This method is highly suitable teaching tool in Anatomy, because the product was invented as a low cost procedure with high quality and durability. The cadavers that have been donated to the Department of Anatomy, FMS, USJP with written consent to use for medical teaching and research purposes were used to obtain specimens.

MATERIALS AND METHODS

Tissue plastination was first discover by von Hagens in 1985 (7).This method of resin casting, the technique is somewhat different from tissue plastination and can easily be performed by anyone with a

low cost. The dehydrated human tissues/organs, while retaining most properties of the original sample and volume are embedded in a uniformly distributed clear synthetic resin cast.

Specimen selection: The specimens were pre fixed using 10% formalin and phenol in order to stop the decaying process of these highly peutrifiable tissues and to reduce the fungal growth respectively. The specimens with high muscle bulk (Eg. Cross section of the thigh) the thin sections were used as it play an important role to the outcome because it will take more time for dehydration process and if not properly dehydrated it will form a layer of water between the specimen and the solidified resin which will make the resin cast useless. Thinner the specimen, better the outcome.

Obtaining a proper specimen/cross section: Specimens were dissected carefully by an Anatomist in order to highlight the relevant structures and areas. The coverings and fascias were removed as they can trap air and alter the final outcome. The Anatomist pre plan the incisions and open up the organs to visualize the interior. The blood clots and other remnants were washed and removed thoroughly. Depending on the type of the organ the method used to take cross-sections will differs. Brain cross sections were taken by using a sharp brain knife and the anatomist being confident enough to take the proper section by a single cut without wasting the preserved organ. This method is also applicable for obtaining sections from small solid organs such as heart, kidney & lung using sharp dissecting knives.

The advantage of this method of taking sections is, it's easier to perform under minimum facilities, but the disadvantage is the thickness of the slice is high and takes more time for dehydration and the final specimen would be heavier and more resin are needed. Same section with better quality could be achieved from freezing the organ to -25^0C and do the slicing.

To obtain the abdominal cross-section, freeze the specimen in -25^0C for 48hours. The freezing will prevent decaying the specimen and can control the thickness of the cut. Then place the specimen in the wooden mould with interior lining of polythene (Figure 1). The specimen should be positioned using polyurethane blocks in the anatomical position (Figure 2). Then mix the two components of the polyurethane and pour in to the mould (Figure 3 & 4). Polyurethane form will fix cure in 10-15 minutes. Once it is cured remove the polyurethane block contain human tissue

(Figure 5). Then remove the block and send it for sectioning using a high speed band saw. By this method it will help to fix the specimen in anatomical position and prevent moving during cutting. The thickness can be adjusted by changing the gap between the blade and the plate which placed in parallel with the blade. Once the slices are prepared, slowly remove the polythene cover and take the specimen. Left over polyurethane parts can be reused to fix the next specimen in the anatomical position before putting the liquid polyurethane.

If these chemicals are not available in the lab one can easily freeze the specimen in -25^{0}C for 48hours and cut it by using a hand saw in order to get the slices. But the thinness of the specimen is higher, the uniformity of the specimen is lost and the quality of the cut is not as fine and clear as by the electric band saw.

Dehydration: 99.9% Acetone was used for the dehydration. The specimens were dipped without folds in an acetone bath and kept at room temperature (27^{0}C), changing the acetone weekly. Acetone density was assessed using acetonometer weekly and processed repeated until acetone density approaches 95 -98% at 27^{0}C. During this room temperature dehydration specimen will reduce its volume evenly by 20%. To minimize this volume reduction, the same dehydration process could be carried out -25^{0}C, where the tissue volume reduction is around 10%. Depending on the size and the thickness of the specimen the duration of the dehydration may vary. 5mm thick cross section of abdomen minimally will take 1-2 months to get completely dehydrated. Graded Alcohol series were also used for the dehydration. But the final outcome was not up to the level as Acetone being used.

Resin casting: Final casting was done using a lead / head resistant plastic moulds. The total volume of the lead or plastic mould was measured initially. Then the estimated dehydrated specimen volume was subtracted from the total volume. Final volume was divided in to 3 parts. Commercially available mould release was applied on the inner surfaces of the mould for easy removal of the final product. Degassed clear resin (volume of 1/3 of the final calculated volume) with the hardener mixed in 100:1 ratio respectively. This will lead to an exothermic polymerizing chain reaction. Meanwhile the dehydrated specimen was taken out and dipped in a resin bath.

In 15 -20 minutes time the resin would convert to a semi solid state. Once the mixture became semi solid state the 2nd

1/3 of degassed resin was mixed with the hardener and applied with the specimen. Once the 2nd layer is becoming semisolid level the 3rd layer was poured on top of it and left 24 hour for proper curing

Solidified cast was removed after 24h and the surfaces were polished using series of water sand papers and brazo for a better outcome.

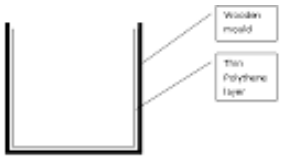

Figure 1. Wooden mould lined by a thin polythene layer

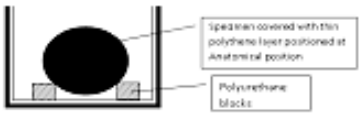

Figure 2. Specimen set at anatomical position in the mould box

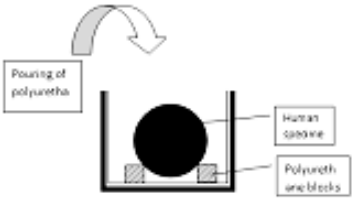

Figure 3. Pouring of the polyurethane in to the mould

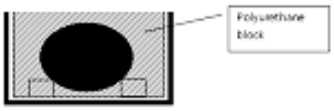

Figure 4. Finally allow to set the specimen in the polyurethane mould

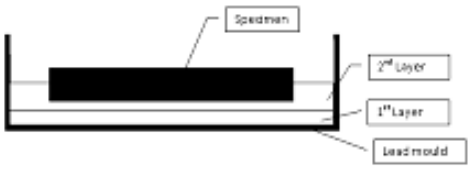

Figure 5. After 2nd layer of resin poured

RESULTS AND DISCUSSION

In this invention, highly dehydrated human tissues/organs are embedded in a uniformly distributed synthetic resin. In another aspect, the invention provides a method of preparing the human tissues/organs/sections which the water

content is completely removed from water-bearing human tissue while the original shape and volume of the tissue is significantly maintained. This method is highly validated for cross sectional anatomy demonstration. Also from this method can be applied for more delicate tissues like brain cross sections demonstration and to demonstrate areas and of body cavities which are very difficult and time taking to dissect and demonstrate in normal anatomy dissection hall for student teaching.

Thinner the specimen slice the outcome is better. The resin cast mounted specimens are more durable than other specimen preservation methods used in Sri Lanka. The specimens are dry and odorless and these casts are best used at initial stages of learning anatomy so that the elements of fear/apprehension of the students towards handling of cadavers are removed. These resin casts are at present used for teaching/learning anatomy at FMS, USJP. This new invention will have zero exposure to formalin when students are handling the specimens, retaining the structural details. As the specimens casts are highly durable, so that the tissue wastage is minimal. Thereby the cost of preservation and maintenance of cadavers were reduced drastically. The outcome of tissues with lot of bone and fat tissue is very much high because of containing less water and easy to dehydrate.

The Ideal dehydration technique used is with 99.9% acetones at 27^0C. Even though graded alcohol series is routinely practiced in histology slide preparation it was not helpful in resin casting. Because the specimen is larger (compared to histology slide) and having high water content.

The acetone dehydration process could be done also in -25^0C in order to minimize the tissue shrinkage and gives the maximum efficacy of dehydration by acetone. Final output of dehydration at 27^0C is equal to performing it at -25^0C except for the difference in tissue shrinkage and duration for dehydration.

CONCLUSION/ RECOMMENDATION

Undoubtedly the detailed anatomy is best learned by cadaver dissections and use of cadaveric specimens. Resin casting is a highly successful supplementary method of teaching/learning gross and cross

sectional Anatomy with no exposure to formalin and other health hazards. Also this method drastically reduces the cost of human tissue preservation, maintenance and disposal. In this method the specimen were embedded in a clear resin solid mould and it is easy to handle, specimen architecture is preserved as the original specimen with high durability. Also method will reduce the fear/apprehension of the students to handle real human tissues in learning anatomy. Reduction to the exposure of formalin is another advantage. Specimens based learning of cross sectional anatomy is much easily studied from this method.

REFERENCES

1. McLachlan JC, Bligh J, Bradley P, Searle J. Teaching anatomy without cadavers. Medical Education 2004; 38: 418-424.
2. Gregory JK, Lachman N, Camp CL, Chen LP, Pawlina W. Restructuring a basic science course for core competencies: An example from anatomy teaching. Medical Teacher 2009; 31: 855-861.
3. Durosaro ONL, Pawlina W. Use of knowledge-sharing web-based portal in gross and microscopic anatomy. Annals Academy of Medicine Singapore 2008; 37: 998.
4. Temkin BEA, Malvankar A, Vaidyanath S. An interactive three-dimensional virtual body structures system for anatomical training over the internet. Clinical Anatomy 2006; 19: 267-274.
5. Hagens GV. Impregnation of soft biological specimens with thermosetting resins and elastomers. The Anatomical Record 1979; 194: 247-255.
6. Collins JP. Teaching and learning anatomy.Student BMJ 2008; 16.
7. von HAGENS G. Heidelberg plastination folder. Anatomisches Institut I, Universitat Heildelberg 1986.

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A Case report on Midline Facial Cleft Associated with Ambiguous Genitalia and Umbilical Defect

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ABSTRACT

Congenital midline facial anomalies are a rare group of disorders that are often accompanied by a constellation of other clinical anomalies, many of which have been recognized as syndromes. The index case is a child with midline facial defect with cleft palate associated with ambiguous genitalia and an umbilical defect. Differential diagnoses including Holoprocencephaly (HPE), Midline facial Plane defect, Oral-facial Digital syndrome, and Kallmanns syndrome are discussed. Although the most probable diagnosis is HPE, ambiguous genitalia and umbilical deformity are atypical findings which merit special mention.

Key words: Midline facial cleft, ambiguous genitalia, cleft lip and palate

INTRODUCTION

Although orofacial defects are among the most common of congenital deformities, arising in 1 in 700 live births (1). Midline facial defects are rare. Whilst early diagnosis and well-timed surgical interventions are mandatory for a normal life, management is often imperfect, due to the fact that syndromic associations are difficult to define. Among the associations reported in the literature, conditions such as holoprocencephaly, oro-facial-digital syndrome, Median Facial Plane defect and Kallmanns syndrome require consideration. We report a case of midline facial defect, associated with ambiguous genitalia and umbilical hernia.

CASE REPORT

Informed consent was sort from the parents for publication of this material. The proband is a month old baby, born at 40 weeks gestation, with a birth weight of 2500grams, being the third child of a consanguineous marriage. Examination revealed a mid-line facial cleft separating the upper lip and a complete palatal cleft and microcephaly (Figure1).

An umbilical hernia and an underdeveloped phallus with incomplete labial separation and no obvious vaginal opening were also detected (Figure 2). An ovoid mass was palpable in the left labio-scrotal fold. Other systems were normal.

A trans-fontanellar ultrasound scan of the

brain confirmed microcephaly. Abdominal ultrasound scan identified the inguinal mass as the left testis. The right testis, ovaries or a uterus could not be detected. Following on a presumptive diagnosis of Kallmanns' Syndrome, thyroid hormones, TSH levels and HCG levels were investigated in order to assess pituitary functions. The results were normal. At the age of 1 month the baby was referred to the Department of Maxillofacial Surgery, Faculty of Dental Sciences, Peradeniya, Sri Lanka for further management. An additional referral was also made to the Department of Anatomy, University of Peradeniya for further assessment of ambiguous genitalia. A buccal smear preparation for the identification of X chromatin was carried out but was found to be negative favoring that of the male genotype. Follow-up revealed that although the weight gain was steady, the occipito-frontal circumference was not increasing to expected standards.

An operative corrective procedure was performed on the external facial defect under general anaesthesia by the consultant maxillofacial surgeon. No intraoperative complications were noted, but due to the atresia of the nasal segment postoperative intranasal intubation was required. The immediate postoperative course was uneventful. Feeding was commenced 4 hours later and recovery henceforth was expedient. The nares were extubated two days later and normal respiration was established.

Figure 1. Midline facial cleft extending into a palatal cleft

Figure 2. Umbillical hernia

Figure 3. Appearance of genitalia

DISCUSSION

Cleft lip with or without associated cleft palate (CLP) is one of the most common congenital anomalies accounting for 9.92 per 10,000 live births worldwide.(2) However, median cleft lip, is very rare and accounts for only about 0.5% of all cases of cleft lip (2).

A median cleft lip is one that involves the middle of the upper lip the area of the philtrum. This defect has a different pathophysiology from CLP and is caused by a lack of development of the maxillary bony processes to extend medially and join in the midline below the nose (3).This median cleft lip anomaly has been associated with several disorders, which are holoprosencephaly (a severe anomaly of the brain), Oral–Facial–Digital (OFD) syndrome and Median Facial Plane (MFP) defect. MFP is a defect that involves the eyes, nose, and forehead. Major features of this abnormality include hypertelorism, a bifid nose, and a broad nasal bridge in association with a median cleft lip and palate. In the index case, however, the hyperteleorism index was 3.35, falling well within the normal (4). Furthermore, the nose was not bifid, and no evidence of frontal encephalocele could be found. Holoprocencephaly is accompanied by a spectrum of characteristic craniofacial anomalies in about 80% of patients (5). Malformations of the nose include complete absence, agenesis of the nasal cartridge, and proboscis (flat nose with a single central nostril without nasal bones), and palatal anomalies include midline and lateral clefts, midline palatal ridge, bifid uvula and absence of the superior labial frenulum, all of which are consistent with the proband. However, in addition to the above, the proband also has an umbilical hernia and ambiguous genitalia, not commonly described in association with holoprocencephaly.

The presumptive diagnosis of Kallmann de Morsier Syndrome refers to the association of congenital hypogonadotropichypo-gonadism with anosmia or hyposmia. Although it is associated with midline facial defects, other manifestations such as syndactily, short forth metacarpals, craniofacial asymmetry, renal agenesis, nerve deafness, malrotation of the gut, congenital heart disease were not in evidence.

CONCLUSION

Median cleft lip and palate is a rare condition and maybe associated with different congenital anomalies. Such cases warrant mention due to difficulties in management of these patients.

REFERENCES

1. Mossey P, Castilla E. Global registry and database on craniofacial anomalies: report of a WHO Registry Meeting on Craniofacial anomalies: Geneva, Switzerland: 2001. http://www.who.int/genomics/anomalies/en/CFA-RegistryMeeting-2001.pdf
2. Sekhon PS, Ethunandan M, Markus AF, Krishnan G, Rao CB. Congenital anomalies associated with cleft lip and palate-an analysis of 1623 consecutive patients. Cleft Palate-craniofacial J, 2011;48:371-8.
3. Sedano HO, Gorlin RJ. Frontonasal malformation as a field defect and in syndromic associations. Oral Sur Oral Med Oral Pathol 1988;65:704-10.
4. Everekliogˇlu C, Doganay S, Er H, Tercan M, Gunduz A, Balat A, Borasan M. Interpupillary index: a new parameter for hypo-hypertelorism. JCraniomaxillofac Surg2001;29:191-4.
5. DeMyer W. The median cleft face syndrome. Differential diagnosis of cranium bifidum occultum, hypertelorism, and median cleft nose, lip, and palate. Neurol. 1967;17:961-71.

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A Rare Presentation of the Left Renal Vein

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ABSTRACT

The Left Renal vein lies ventral to the left renal artery at the hilum and drains into the inferior vena cava at a right angle, at the level of L2 vertebra. The left renal vein is usually three times the length of the right renal vein. It is a common vessel of drainage for left gonadal vein, left suprarenal vein and left inferior phrenic vein. During routine dissections at Faculty of Medicine, University of Peradeniya, in an elderly female cadaver, variations in the left renal vein anatomy was observed. Abdominal viscera and fascia were methodically removed to reflect the posterior abdominal wall from an anterior aspect of view. Lengths of both veins were measured. As a result, two prominent tributaries draining the left kidney were observed, uniting to form the left renal vein, dorsal to the left renal artery. The left inferior phrenic vein joined the left suprarenal vein to subsequently drain into the left renal vein. The left ovarian vein drained directly in to the left renal vein. Two lumbar veins were also observed to drain through a common vein in to the left renal vein. The left renal vein ran inferomedially in an oblique course to drain into the inferior vena cava at an angle of 60 degrees clockwise at the level of the L4 segment. The length of the left and the right renal veins were respectively 11.8 cm and 3.2 cm, both longer than usual. Understanding the variations in renal vascular anatomy is important for urological surgeons to ensure haemostasis during surgery.

***Key words*:** rare, variation, left renal vein

INTRODUCTION

Small veins of renal segments communicate with one another to subsequently form 5 or 6 interlobar veins that unite at the hilum to form a single left renal vein. Usually the vein is in ventral position to the corresponding left renal artery, at the hilum. It runs behind the pancreas to drain into the inferior vena cava at a right angle, at the level of L2 vertebra. The left renal vein is usually three times the length of the corresponding right renal vein (around 7.5 cm against 2.5 cm) (1). This is due to the fact that the left renal vein runs across the abdominal aorta

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ventral to it, and immediately below the origin of the superior mesenteric artery, in order to drain into the inferior vena cava. The left renal vein is a common vessel of drainage on the left side, typically receiving the left gonadal vein (ovarian or testicular), left suprarenal vein, and often than not, a left inferior phrenic vein. In contrast, the right renal vein drains only the right kidney (1).

As per clinical implications, during surgeries for aortic aneurysms, left renal vein needs to be ligated, provided that it is done to the right of the point of entry of the gonadal and suprarenal veins (1). In addition variations in renal vascular anatomy are important during treatment for renal trauma, renal vascular hypertension, renal transplants, nephrectomy etc. In an era of renal surgeries being frequent in the arena of surgery, a meticulous and accurate knowledge on the renal vasculature is mandatory for successful procedures and to avoid common vascular injury in posterior abdominal approaches.

Regularly reported variations of the left renal vein include, accessory renal vein, retro-aortic or circumaortic position and supernumerary (2). The comparatively complex nature of drainage reported in this case does not seem to be cited in previous literature.

MATERIAL AND METHODS

During routine dissections conducted by undergraduates of the Faculty of Medicine, University of Peradeniya, in an elderly female cadaver, a variation in the left renal vein anatomy was observed. Abdominal viscera and fascia were methodically removed, preserving the vasculature and other landmark structures to reflect the posterior abdominal wall from an anterior aspect of view. The right renal vein and both renal arteries were also observed for variations. Lengths of both veins were measured.

RESULTS

On observation, there were two prominent tributaries dorsal to the left renal artery and outside the hilum of the left kidney uniting to form the left renal vein. The left kidney was not ectopic or malformed. The left inferior phrenic vein joined the left suprarenal vein 2-3 cm below its origin subsequently draining into the left renal vein. The left ovarian vein draining into the left renal vein was also noted. In addition two other veins emerging from the posterior abdominal wall respectively below T12 and L1 vertebral bodies, which were identified as lumbar veins, were observed to join and drain through a common stem into the left renal vein in close proximity to the point of left suprarenal venous drainage. From this

point the left renal vein was observed to run inferomedially in an oblique course to drain into the inferior vena cava as far down as the level of the aortic bifurcation; in this specimen; the upper border of the L4 segment. The vein joined the inferior vena cava approximately at an angle of 60 degrees clockwise. No other variation in the same vein was observed. There were neither variation in the Right renal vein nor in renal arteries. The length of the left and the right renal veins were 11.8 cm and 3.2 cm, respectively. Hence, this combination deviated from the usual presence of a left renal vein three times the length of the right renal vein. Both renal veins were longer than usual.

DISCUSSION

Such a variation may rarely cause complications in terms of physiology, but veins being highly susceptible to trauma, preoperative recognition of such anomalies in the renal vasculature are of great importance to ensure haemostatic control (2) during posterior abdominal/renal procedures. These venous anomalies result from embryological developmental errors. Renal transplants are a common clinical indication where renal veins are manipulated to a greater extent. Statistics on renal transplants in Sri Lanka are at escalating rates. The success rate of this surgical procedure within the country is only 90% and thus has ample opportunity for refinement.

Knowledge on morphological variations of renal arteries and veins in individual cases is vital for urological surgeons operating on this region as it could prevent surgical complications due to accidental vascular injuries at the time of surgery (2).

REFERENCES

1. Sinnatamby CS. Last's Anatomy; Regional and Applied. 11th edition.
2. Panagar AD *et al*. Journal of Clinical Diagnostic Research. 2014; 8: 111–112.
3. Galabada DP, Nazar AL, Ariyaratne P. Survival of living donor renal transplant recipient in Sri Lanka: a single-center study. Saudi J kidney Disease & Transplantation. 2015; 22; 1334-40.

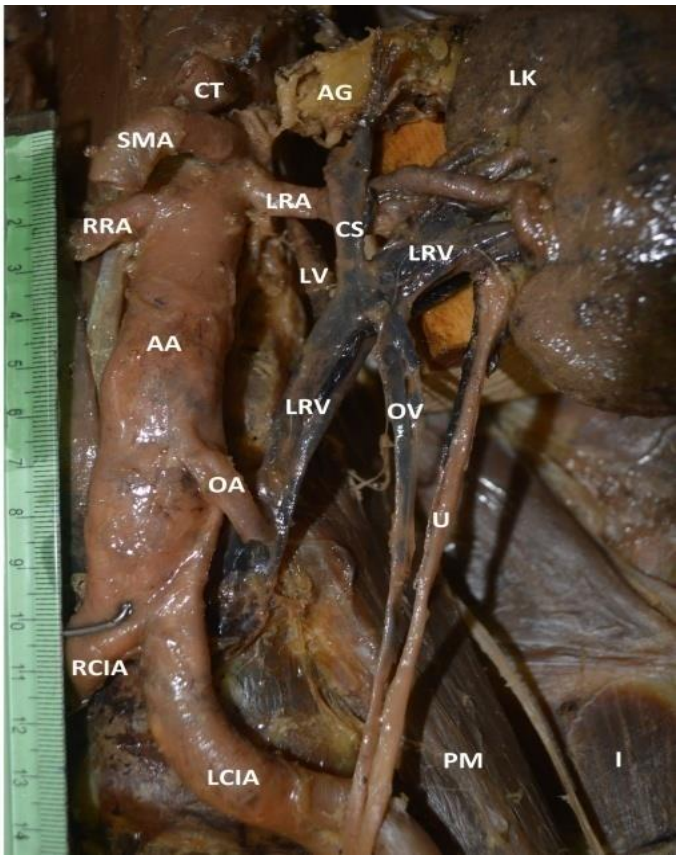

Figure 1: Left kidney vasculature seen in an anterior dissection of the abdominal wall with the stomach and pancreas removed.
AA-Abdominal Aorta, AG-Adrenal Gland, CS-Common stem of inferior phrenic and suprarenal veins, CT-Coeliac Trunk, I-Iliacus muscle, LK-Left Kidney, LCIA-Left Common Iliac Artery, LRA-Left Renal Artery, LRV-Left Renal Vein, LV -Lumbar Vein, OA-Ovarian Artery, OV-Ovarian Vein, LRV-Left Renal Vein, LV-Lumbar Vein, OA-Ovarian Artery, OV-Ovarian Vein, PM -Psoas Major muscle, RCIA-Right Common Iliac Artery, RRA-Right Renal Artery, SMA-Superior Mesenteric Artery, U-Ureter.

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The Sri Lanka Journal Anatomy publishes the following categories of articles which have relevance to Anatomy and allied sciences.

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Journals

Standard journal article

Bartlett IG, O'Keefe P. The bacteriology of the perimandibular space infections. JOral Surg 1979; 37: 407-409.

Corporate (collective) author

WHO COLLABORATING CENTRE FOR ORAL PRECANCEROUS LESIONS. Definition of Leukoplakia and related lesions: an aid to studies on oral pre cancer. Oral Surg Oral Med Oral Pathol 1978; 46: 518-539.

Unpublished article

Barker DS. Lucas RB. Localized fibrous growth of the oral mucosa. J Dent ?Res 1965: in press.

Books and other monographs

Pindborg JJ. Atlas of diseases of oral mucosa. 5th edition. Copenhagen: Munksguard, 1992: 50-66.

Chapter in book

Boyde A. Amelogenesis and the structure of enamel. In: Cohen B. Kramer KH(eds). Scientific Foundations of Dentistry. William Heinemann Medical Books Ltd. London. 1976: 335-352.

No author given

International statistical classification of diseases and related health problems, 10th revision, vol 1. Geneva: World Health Organization, 1992; 550-564.