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EDITORIAL

New Trends in Teaching Anatomy

Recent reports from the United Kingdom and Australia claim "the teaching and learning of anatomy in universities is in crisis" and this is attributed to less time being allocated to the subject and decreased opportunities to dissect cadavers.

Is the situation same in Sri Lanka?

Anatomy is the cornerstone of undergraduate and postgraduate medical education. Techniques of teaching Anatomy have been gradually changing over a long period of time from cadaver dissection based study of regional gross anatomy, histology and embryology to blended learning what we see today.

The evolutionary changes and trends are due to the needs of the updated medical undergraduate and postgraduate curricula, the introduction and adoption of new IT based methods of teaching and learning activities and the changing learning strategies of the Generation Y or Millennials.

We still receive adequate cadaver donations for the universities to be utilized for undergraduate and postgraduate teaching of anatomy thanks to the religious and moral values of the people of our country. Highest rated medical faculties in the world still continue cadaver dissection and prosected specimen based teaching and learning which is a self learning, student centered, interactive, group activity in the anatomy curricula.

Having said that, going with the current trends in the world, we should not hesitate to take appropriate steps to encourage our students to embrace newer strategies and efficient use of new technology. For example IT based interactive self learning modules, cadaveric or model based hands on imaging anatomy techniques such as ultrasound scanning in the dissection rooms. The teachers should be exposed to and trained in new teaching methods and efficient use of new technology which will enhance better dissemination of knowledge and skills.

Being a developing country we may have financial constrains which limit our ability to embark on modern technologies. However even with the low resource setting we can encourage our students themselves to develop learning resources which will be utilized for teaching and learning.

At the same time we must not under estimate the value of cadavers which are made available for dissections and utilize them to the maximum.

All in all it is a challenge to the modern day anatomist to teach more clinically relevant, applied anatomy to suit the needs of the qualifying doctors.

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REVIEW ARTICLE

The Anatomy of Urinary Continence

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Abstract

The urethral sphincter complex comprises of an internal urethral sphincter (IUS) and an external urethral sphincter (EUS) reinforced by pelvic floor muscles. The IUS is comprised of smooth muscle, and is under the control of autonomic nerves. The EUS is composed of skeletal muscles, thus it is under the control of somatic nerves. When sympathetic outflow overrides the parasympathetic outflow, the IUS contracts and the bladder relaxes and fills with urine. Simultaneously the pudendal nerves stimulate the contraction of the voluntary EUS. Local reflex arcs at the spinal level controls micturition. Higher centres regulate this reflex. The pontine micturition centre (PMC) facilitates micturition while frontal inhibitory centre (FIC) inhibits it.

Article

Introduction

Urethral sphincters, its innervation and central neural coordination are essential to maintain urinary continence. Historically, the sphincter mechanism was described as two components: the internal urethral sphincter (IUS) and the external urethral sphincter (EUS). Subsequently, the concept of a rhabdosphincter evolved, where a continuous longitudinal muscle coat encircles the membranous urethra. The urethral sphincters are innervated by both somatic and autonomic nerves. The pontine micturition centre and the inhibitory centres in the frontal cortex coordinate the neuronal signalling, thus enabling the control of micturition. In this article, we describe the anatomical basis of urinary continence: the historical perspective and the new understanding.

Anatomy of the urethra and the sphincter complex

Anatomy of the urethra

The urethra extends from the internal orifice of the urinary bladder to the external urethral opening. Male urethra is approximately 18 to 20 cm long. It has an initial short course, approximately 1 cm in length, before it reaches the prostate gland (preprostatic urethra). Then it tunnels through the prostate for 3-4 cm (prostatic urethra). Having emerged slightly anterior to the apex of the prostate, it traverses a region historically known as the urogenital diaphragm. This part of the urethra is known as the membranous urethra. The prostate rests on the urogenital

diaphragm. The membranous part of the urethra is 2-2.5 cm in length. It is the least distensible part of the urethra. Then the urethra progresses with an anterior curvature (bulbar urethra) within the superficial perineal space. It terminates at the urethral meatus or the external orifice after traversing the corpus spongiosum of the penis (penile urethra). The female urethra is approximately 4 cm long. It passes through the deep perineal space and terminates at the vestibule.

The internal urethral sphincter (IUS)

The IUS is situated at the junction between the urinary bladder and the proximal urethra. In males, it is considered to be located at the preprostatic urethra. The IUS consists of smooth muscles. These muscle fibres are in continuity with the detrusor muscle of the urinary bladder. But the detrusor muscle fibres do not contribute to the IUS. The smooth muscle fibre bundles of the IUS are arranged in a horseshoe shape manner. There are inner longitudinal and outer circular muscle layers reinforced by elastic connective tissues.

The external urethral sphincter (EUS)

The historical understanding was that the urethra was encircled by skeletal muscles as it traverses the deep perineal space. This region was described to be comprised of the EUS muscles sandwiched by two layers of fascia. The inferior fascial layer of this region was also known as the perineal membrane. The EUS was also known as the urogenital sphincter. This was described as being located immediately below the bladder in females (Figure 1) and at the level of the membranous urethra in males.

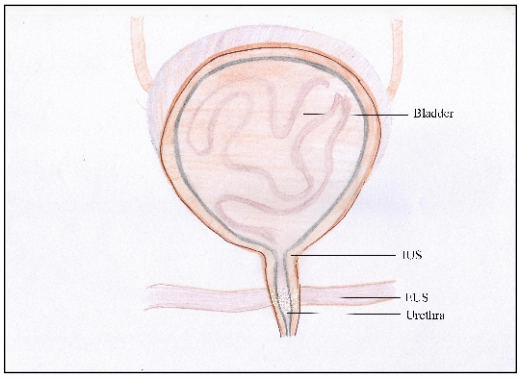

Figure 1: The female urethral sphincter complex according to the historical understanding. (IUS - Internal Urethral Sphincter, EUS - External Urethral Sphincter)

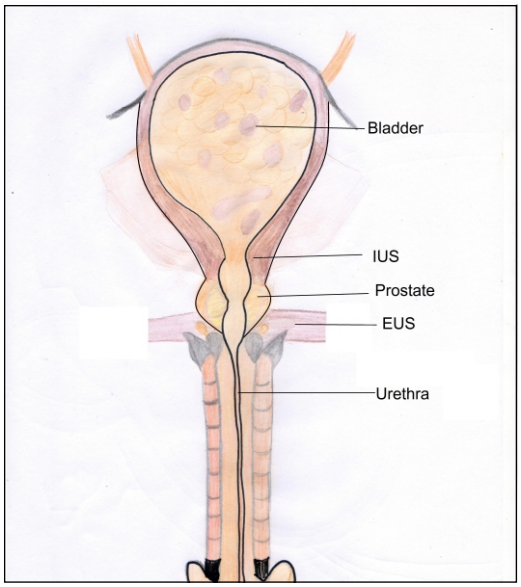

Figure 2: The male urethral sphincter complex according to the historical understanding. (IUS - Internal Urethral Sphincter, EUS - External Urethral Sphincter)

The Rhabdosphincter

In 1980s, Oelrich compared and contrasted microscopic and macroscopic anatomy of the urethral sphincters in

males and females. His detailed histological examinations provided the foundation for the current understanding of the anatomy of the EUS. Moul described that the EUS extended from the distal part of the prostatic urethra to the urogenital diaphragm. In 1997, Keith et al histologically evaluated cadaveric dissections and the tissue samples of radical prostatectomies. According to him the urogenital diaphragm does not exist. The EUS is a cylindrical muscle surrounding the membranous urethra. This idea was reinforced by several other studies. These muscle fibres start as two separate bundles on either side of the urethra. These expand towards the anterior surface of the urethra and are continued with the corresponding fibres of the opposite side of the body. Collectively it forms a broad arcing muscle layer anterior to the urethra. Imaging studies conducted by Wang et al. in 2014 confirmed that the urethral sphincter complex was a cylindrical structure surrounding the urethra and extending vertically from the bladder neck to the perineal membrane, which is more dense inferior to the colliculus seminalis. This cylindrical muscle coat is currently referred to as the rhabdosphincter (Figure 3: male rhabdosphincter). In the female the rhabdosphincter is described as mainly surrounding the upper and middle thirds of the urethra (Figure 4: female rhabdosphincter).

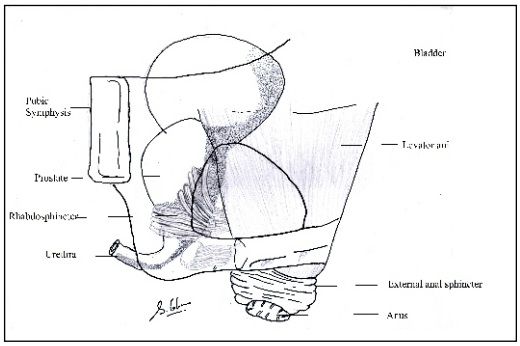

Figure 3: The male urogenital system showing the male rhabdosphincter

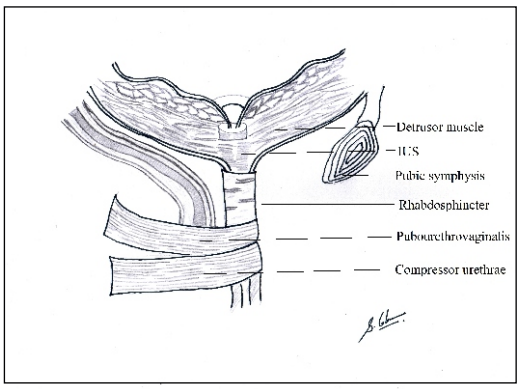

Figure 4: The female urogenital system showing the female rhabdosphincter. (IUS - Internal Urethral Sphincter)

The pelvic floor muscles

The continence mechanism at the level of the membranous urethra in males is reinforced by the pubourethral component of the levator ani muscle in the male. The striated fibres of the pubourethralis arise from the inner surface of the ischiopubic ramus and surround the membranous urethra like a sling. In females, a similar muscle is found to encircle both the urethra and the vagina (pubourethrovaginalis). Additionally, in the female, fibres arise from the ischial rami and pass anterior to the urethra (compressor urethrae). These

pelvic floor muscles act independently from the IUS and EUS, thus should not be confused with the urethral sphincter complex.

Urethral coaptation

Deep to the two smooth muscle layers of the IUS, there is a well-developed venous plexus. It is situated in the submucosa of the urethra. The watertight closure of the urethral lumen is thought to be achieved by the presence of this venous plexus, thus contributing to urinary continence. The circular arrangement of the submucosal elastin fibres at the neck of the bladder also contributes to urinary continence.

Innervation of the urethral sphincters

The IUS has smooth muscle fibres. Hence, it is innervated by the autonomic nervous system. The sympathetic nerves supplying the IUS and the bladder are derived from T10 to L2 spinal segments (the thoracolumbar sympathetic outflow). The preganglionic fibres relay in the inferior mesenteric ganglion and the ganglia of the inferior hypogastric plexus. The postganglionic fibrespass via the inferior hypogastric plexus and its branches and small plexuses surrounding the pelvic organs which it supplies. The parasympathetic fibres to the IUS are transmitted via the pelvic splanchnic nerves (also known as the nervi erigentes) arising from theS2 to S4 spinal segments (the sacral parasympathetic outflow). These also contribute to the inferior hypogastric plexus. The inferior hypogastric plexus is situated in the extraperitoneal connective tissue on either side of the rectum in the male and rectum and vagina in the female. The smaller complexes surrounding the pelvic organs arise from this. The vesical and prostatic complexes lie posterolateral to the seminal vesicles, prostate and the base of the urinary bladder. The upper limit of the plexus is beneath the peritoneum of the rectovesical pouch. At its inferior limit, the cavernous nerves emerge. It passes forwards on either side of the prostate, with a spray-like distribution within the false capsule of the prostate and external to its true capsule. These fibres are important for erectile function apart from maintaining urinary continence. In females, the inferior hypogastric plexus lies lateral to the uterine cervix, vaginal fornices and the posterior part of the urinary bladder. The nerves emerging from this plexus run anteriorly in the base of the broad ligament Thus these nerves are liable for damage during surgical procedures such as radical prostatectomy, anterior resection and total abdominal hysterectomy.

The EUS is derived from skeletal muscles. Therefore it has a somatic innervation. The somatic nerves to the EUS originate from a specialized area named Onuf's nucleus in the sacralspinal cord. This nucleus extends from S2 to S4 spinal segments. The somatic outflow is carried via the perineal branch of the pudendal nerve to the EUS. Muscles of the pelvic floor are also supplied by a similar group of somatic nerve fibres arising from S2 to S4 spinal segments.

The neural control of micturition

Micturition has two phases: filling phase and the voiding phase. This process depends on the neuromuscular coordination of the reservoir (the bladder) and the outflow tract (the urethra and the sphincter mechanism). Micturition is an autonomic reflex. But it is regulated by voluntary neural mechanisms which involve centres in the brain and the spinal cord.

The function of autonomic and the somatic nervous systems

There is a tonic discharge of both the sympathetic and parasympathetic nervous systems. The balance between the two systems determines the phase of micturition. During filling, increased sympathetic activity contracts the IUS and relaxes the detrusor muscle of the urinary bladder. Noradrenaline is released by postganglionic sympathetic nerve endings. Noradrenaline acts on the α-adrenergic excitatory receptors on the IUS to contract it. Noradrenaline also acts on the β-adrenergic inhibitory receptors in the detrusor, to relax the bladder. Conversely with voiding, increased parasympathetic activity contracts the detrusor and relaxes the IUS. Postganglionic parasympathetic nerve fibres release both cholinergic (acetylcholine) and non-adrenergic, non-cholinergic neurotransmitters. Contraction of the urinary bladder is mainly mediated by acetylcholine acting on M3 muscarinic receptors in the detrusor muscle. The IUS is relaxed via nitric oxide released by the parasympathetic nerves. The skeletal muscles of the EUS relax once the somatic outflow is inhibited during micturition.

Local reflex arc at the level of the spinal cord

A plexus of sensory neurons is situated deep to the urothelium of the bladder. This plexus is particularly dense at the neck of the bladder. The sensation of bladder fullness is carried to the spinal cord via the inferior hypogastric plexus.The afferent Aδ and C fibres relay in the spinal segments S2-S4 and T11-L2. The efferent parasympathetic nerves cause relaxation of the IUS. Inhibition of the EUS occurs when somatic efferents are inhibited.

The higher centres

There are few neuronal cell populations in the brain and brainstem which are specific for the control of micturition: these include the pontine micturition centre(PMC), the frontal inhibitory centre and the midbrain periaqueductal grey matter (PAG). There are interconnections between these higher centres. The ascending and descending spinal neurons also synapse with these higher centres.The PMC is situated in the rostral pontine tegmentum. When the bladder is distended, the afferents to the PMC run through the spinotegmental tract of the spinal cord. The efferents from the PMC descend in the lateral funiculus of the spinal cord to inhibit thoracolumbar sympathetic nucleus and the sacral Onuf's nucleus, while

promoting the activity of the sacral parasympathetic nucleus. Thus, the PMC promotes micturition. The frontal inhibitory centresare situated in the inferior frontal gyrusand the anterior cingulated gyrus. These centres inhibit the local reflex arc of micturition by descending pathways. Thus, it increases the sympathetic outflow, reduces parasympathetic outflow. A human positron emission tomography (PET) study showed that the midbrain PAG is active during micturition. The midbrain PAG receives afferents from the sacral spinal segments, which possibly convey sensations concerning the degree of the bladder filling. In turn, the PAG sends signals to the PMC to facilitate micturition. Afferents from the PAG reach higher cortical centres and are important for the conscious perception of the fullness of the bladder.

Conclusions

Urinary continence is a complex mechanism. It involves the internal and the external urethral sphincter complex reinforced by the muscles of the pelvic floor. Local reflex arcs at the spinal level and the higher centres are essential for the coordination of micturition.

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Paediatric Ocular Trauma; a Continuing Problem

Dissanayake MM, Dissanayake PH, Senevirathne HMKRNB

Introduction

Ocular trauma in any population is a major public health concern. Ocular trauma in children has far more serious consequences. The child will have to live with the long-term morbidity compromising on quality of life. Another concern specific to this age group is the risk of amblyopia. Each year an estimated 3.3 to 5.7 million pediatric eye injuries occur worldwide. Worldwide estimates suggest that ocular trauma is responsible for up to 280,000 hospital admissions annually in children aged <15 years.

About 90% of all ocular trauma is thought to be preventable. By identifying any underlying factors in the aetiology of serious injuries, it may be possible to determine the most effective methods of reducing the incidence of visually damaging trauma. In many developed countries the legislation is an important factor in curtailing ocular trauma especially in the context of injury occurring due to fire crackers. Studying factors associated with ocular trauma in our population will be important to policy makers as well as to health care workers facing the problem.

Objectives

To describe the pattern of paediatric ocular trauma and the factors associated with the occurrence of paediatric ocular trauma presenting to a tertiary care eye hospital.

- To identify the incidence of eye injuries according to different age groups.
- To identify the types of paediatric eye injuries.
- To identify the causes for eye injuries in children.

Methodology

This was an observational cross sectional descriptive study conducted at Accident and Emergency service, National Eye Hospital, Colombo. All the patients under 18 years of age who presented at Accident and Emergency service of National eye hospital within 24 hours from the time of eye injury, were recruited.

Patients with following criteria were excluded from the study.

- Patients coming for subsequent visits.
- Patients presenting primarily due to the non traumatic causes.
- Children not accompanied by their proper guardian.

Study instruments

Interviewer administered questionnaire and hospital records were used in the data collection.

Method of data collection

Approval was obtained from the Director

National Eye hospital, Colombo to conduct the study.

The study was conducted in accordance with the Helsinki Declaration and the approval was obtained from Ethics Review Committee, Faculty of Medicine, University of Colombo.

Informed consent was obtained from the parents/guardian after giving the information sheet and explaining about the study.

Method of data analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS) 17.0 version software.

Results

A total of 103 children were included in the study. Majority of the children who suffered from eye injuries were boys (85%) compared to girls.

Children between the 9 to 11 years of age were the most common group (32%) to be affected by eye injuries followed by the age group 12 to 15 years. (29%)

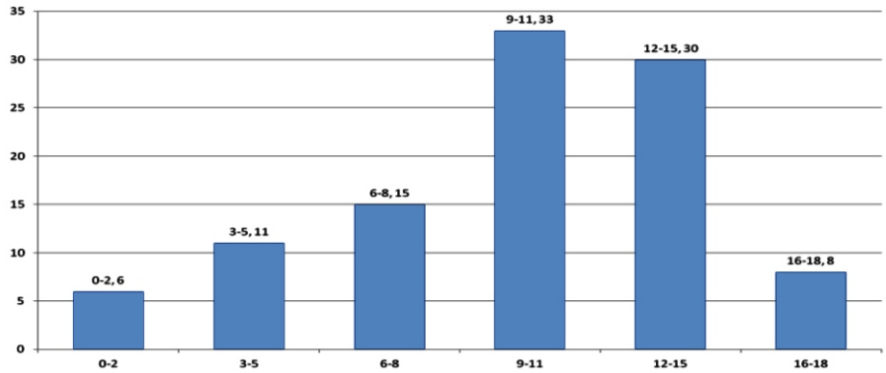

Figure 1: Distribution of Paediatric eye trauma according to age

Most common type of injury was physical blunt trauma (60%) followed by trauma by sharp objects (30%) and chemical injuries (6%).

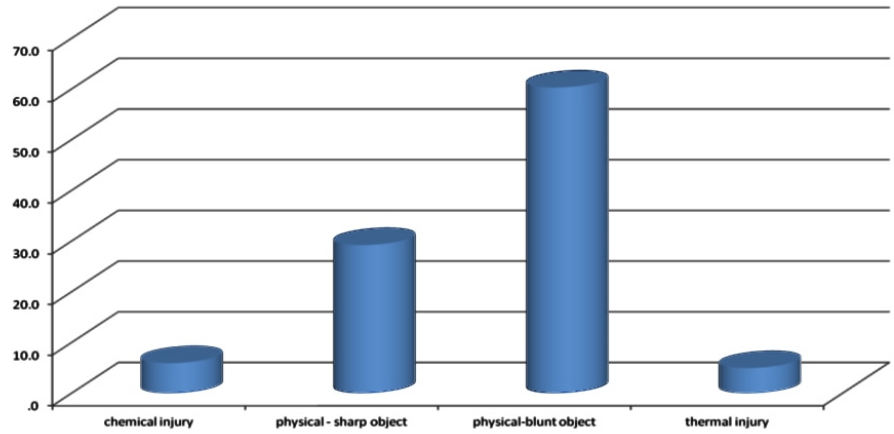

Figure 2: Method of injury

Place of Occurrence of Injury

Most of the injuries occurred in the class room (38%). Second commonest place for the ocular injuries to occur was when the child was at home (26%). Only quarter of all injuries reported had occurred in the play ground (24%).

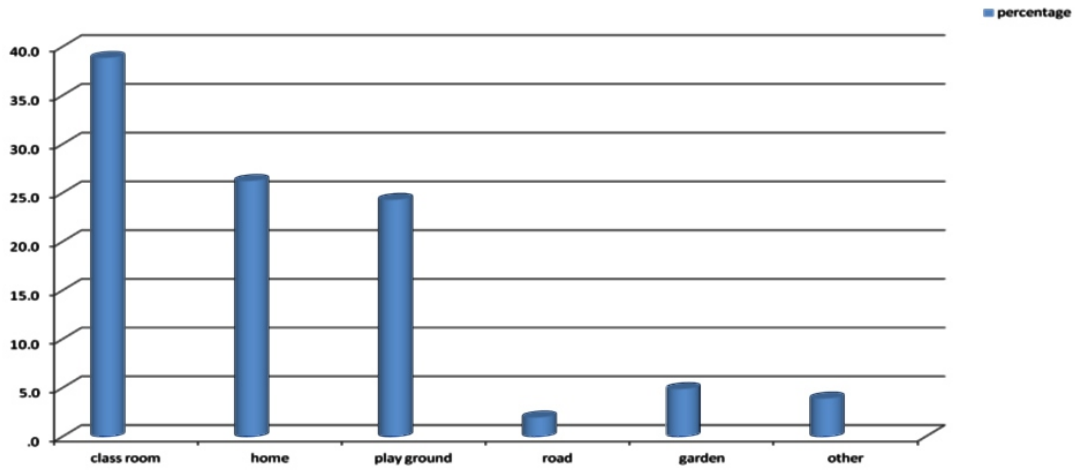

Figure 3: Place of occurrence of injury

Anatomical Part of the Eye Affected

Most commonly affected parts of the eye were Conjunctiva (49%) followed by cornea (39%).

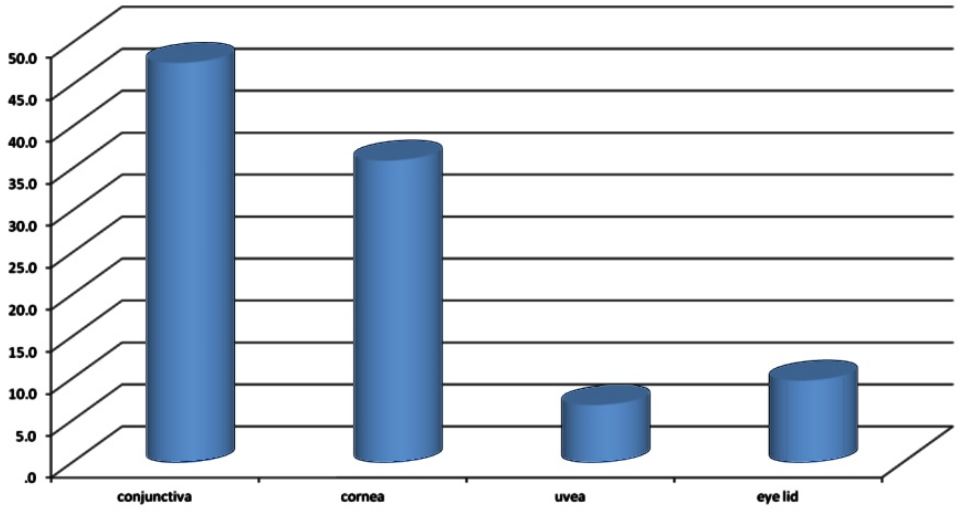

Figure 4: Anatomical location of the injury

The most common type of injury was corneal abrasions (34%) followed by ocular foreign bodies (17.5%) and conjunctival inflammation (14.5%).

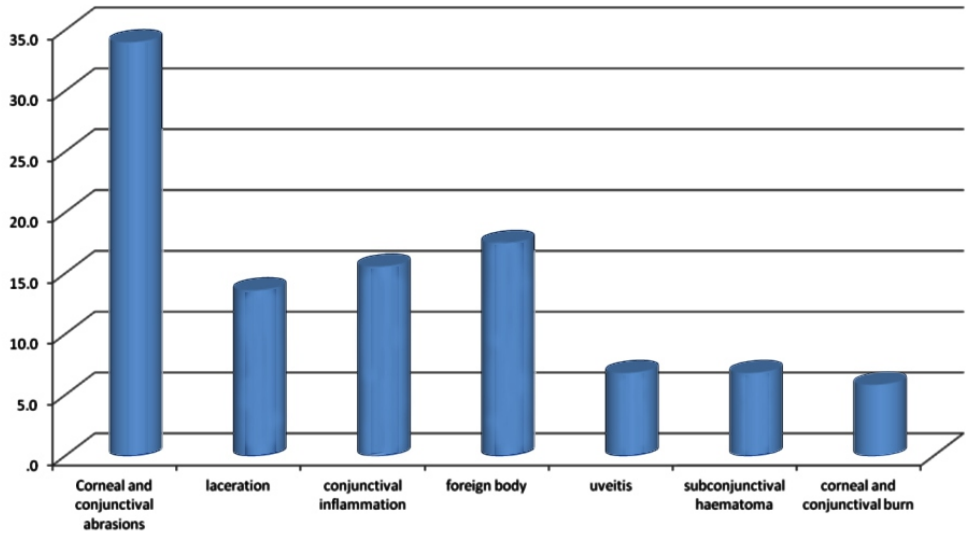

Figure 5: Type of Injury

Majority of patients (77%) were not given correct first aid before coming to the hospital.

Conclusions

Our results are comparable with those found in the literature. Ocular trauma in Children aged 9-11 years showed a peak in incidence with 12-15 year-olds following closely behind. Most common type of injury was physical blunt trauma followed by trauma by sharp objects and chemical injuries.

Most common method of injury was physical blunt trauma followed by trauma by sharp objects and chemical injuries.

Most of the injuries occured in the class room. Second commonest place for the ocular injuries to occur were when the child was at home (26%). Only quarter of all injuries reported had occurred in the play ground.

A noteworthy finding was that majority of patients were not given correct first aid before coming to hospital.

Recommendations

Our study supports the need for eye injury prevention efforts targeting the age, gender, and developmental stage of children. Educating parents, teachers and children about the potential for eye injuries at school, home and during sports activities is an important public health goal.

Education of the public about the correct first aid methods and the importance of early presentation to a healthcare facility should be implemented.

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Conflict of Interests - Nil.

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Body composition and metabolic risk in Sri Lankan adults: A protocol of a cross-sectional study

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Abstract

Background

A high level of adiposity has been identified in South Asians compared to white Caucasians, and it has corresponded with increased cardiometabolic risk. Therefore, assessing body composition and associated metabolic risk is very important to understand ethnic difference of metabolic risk. The present study aims to assess the body composition of a representative sample of adults in Sri Lanka using the deuterium dilution technique.

Methods/Design

A total of 300 Sri Lankan adults aged ≥ 18 years representing ethnic diversities in Sri Lanka will be recruited randomly. Body composition of the subjects will be assessed adopting the deuterium oxide dilution technique; first deuterium oxide (D2O) 99.9% concentration will be diluted to a 10% solution; then the prepared deuterium samples will be administrated to the subjects and their urine samples will be collected over the next 4-6 hours; next deuterium isotope levels in urine samples will be measured by Isotope-Ratio Mass Spectrometry (IRMS). Additionally, anthropometric parameters: body stature, body weight, waist circumference and skinfold thickness; blood pressure and biochemical parameters in blood will be measured. Bioelectrical impedance analysis (BIA) also will be undertaken.

Discussion

Accurate measurement of body composition is considered as an invaluable tool in the assessment of metabolic risk. Nevertheless, a representative study on body composition of adult population in Sri Lanka have not been conducted yet. This study will fill this gap of knowledge regarding body composition and metabolic risk among Sri Lankan adults. Furthermore, this study will derive BMI cut-offs to diagnose under-weight in both men and women. Also the results of our study will facilitate validating a skinfold thickness equation and a BIA prediction equation for Sri Lankan adults of both genders.

Key words: body composition, metabolic risk, adults, Sri Lanka, South Asia

Background

Globally, the prevalence of obesity more than doubled from 1980 to an estimated 13% in 2014 (1). In addition, approximately 40% of the adult population is estimated to be overweight (1). Obesity is associated with numerous conditions including type 2 diabetes, cardiovascular diseases (mainly heart disease and stroke), cancers (including endometrial, breast, and colon), musculoskeletal disorders such as osteoarthritis, and respiratory problems including sleep apnea (1, 2). The collective burden of chronic disease associated with obesity is very high (3).

The adipose tissue has been recognized as an endocrine organ and also as a contributor to the development of several diseases (4), and recent evidence reports a causal association between adiposity and coronary heart disease, stroke subtypes plus type 2 diabetes (5). Moreover, there is also a strong biological association between obesity and increased risk of several cancers (6). Knowledge of the relationship between adiposity and metabolic risk has focused greater attention on the importance of quantification of body composition in the context of prevention and management of chronic diseases (7, 8). Significant differences in body composition have been identified according to gender and ethnicity (9, 10) and this underlines the importance of knowledge and understanding of nuances specific to different populations (11).

South Asia is home to an estimated one fourth of the world population. An increased adipocyte percentage has been identified in South Asians compared to white Caucasians (9) and the epidemic of obesity in many parts of the region has seen the level of obesity increase several fold during the last two decades (12). This high level of obesity in South Asians has corresponded with increased cardiometabolic risk and more commonly identified from an early age. Despite higher cardiometabolic risk being associated with several factors including genetics and unfavourable changes in lifestyle, body composition is a key factor in cardiovascular risk prediction (13).

Sri Lanka is a low-to-middle-income South Asian country with a population of over 20 million and obesity and associated metabolic problems are emerging as major health problems. In spite of the fact that most of the obesity associated non-communicable diseases (NCDs) have reached epidemic proportions in Sri Lankan adults, for example, prevalence of dysglycaemia (diabetes and pre-diabetes) is 20% (14), metabolic syndrome 25% (15) and hypertension nearly 25% (16), the level of obesity among Sri Lankan adults according to the international cut-offs for Caucasians (BMI > 30 kg/m2), is less than 4% (17). This percentage has remained largely unchanged between surveys undertaken 5 years apart (18). Thus, the traditional BMI cut-off levels are clearly not sensitive enough to explain the high metabolic risk among Sri Lankans adults (19).

BMI is not an estimate of adiposity *per se* (10), therefore, a more prudent way of diagnosing obesity among adults would be to estimate body fat content. Non-invasive techniques to predict body fat

include skin fold thickness assessment, bioelectrical impedance analysis (BIA), development of BMI cut-off values and the deuterium (D_2O) dilution technique, however all have advantages and disadvantages (20).

Several studies have been undertaken to assess body composition using the deuterium dilution technique in Sri Lankan children (21), adolescent girls (22) and urban women (23). However, to date there is currently no body composition data on a representative sample of adults in the country.

Study Objectives

1. To assess the body composition of Sri Lankan adults, validate currently used cut-off values of BMI as a measure of underweight, overweight and obesity, and derive BMI cut-offs for men and women.
2. To assess the metabolic risk of adults according to fat mass (FM) percentage.
3. To validate a skin fold thickness (SFT) equation and cross validate prediction equations to determine the suitability of use with Sri Lankan adults.
4. To validate a bioelectrical impedance prediction equation for Sri Lankan adults.

Methods

Study sample

Eligible participants include healthy Sri Lankan adults aged ≥ 18 years recruited from a sub-sample of a national level nutrition survey. Details regarding sampling have been previously reported (24). In this study, a total of 300 participants will be randomly selected to represent both area of residence and ethnicity. Study participants will be recruited after obtaining informed written consent. The Ethics Review Committee, Faculty of Medicine, University of Colombo, approved this study.

Measurements

Body composition

Deuterium oxide dilution technique

Deuterium oxide (D_2O) 99.9% concentration will be diluted to a 10% solution using the steps outlined in Figure 1.

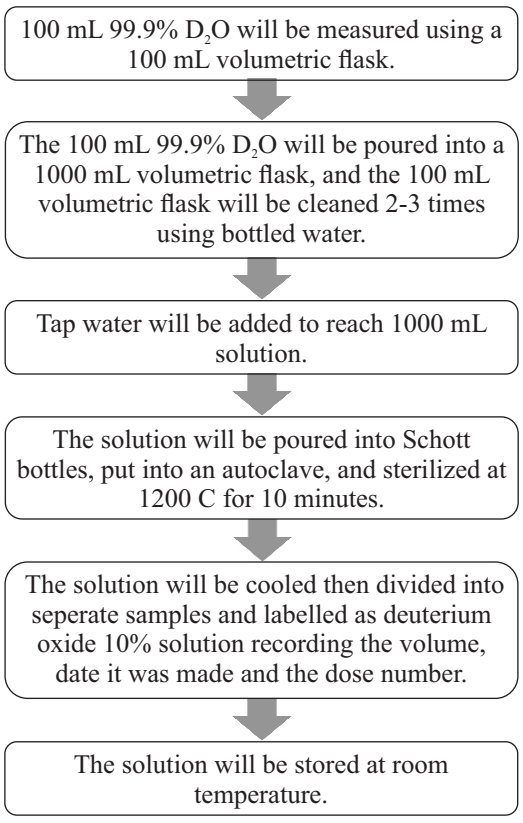

Figure 1: Steps in diluting deuterium oxide (D_2O) 99.9% concentration to a 10% solution

Deuterium administration

The procedure followed during the administration of deuterium is detailed in Figure 2. In summary, the participant will be instructed to consume their normal fluid and food intake on the day before the investigation and to avoid vigorous exercise after the final meal of the previous day to minimise risk of dehydration and depletion of glycogen stores. Participants will be asked to empty their bladder before starting for accurate measurements of Total Body Water (TBW). This will be to ensure that body weight is measured under the same conditions each time. Each participant will be given two cream cracker biscuits to consume during the fasting period and provided with a standard meal after completion of urine collection.

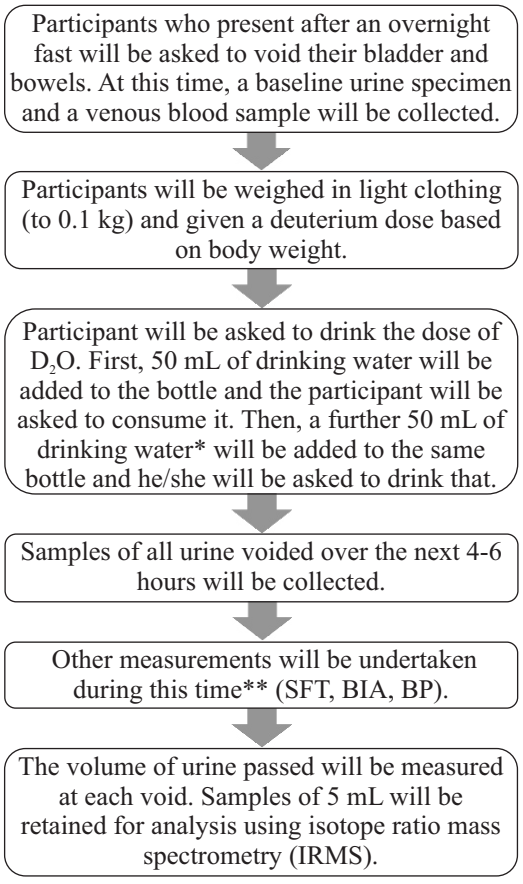

Figure 2: The procedure followed during the administration of deuterium

* Bottled water will be used and isotope levels measured.

** Participants will be given two cream cracker biscuits to eat during this time.

SFT - Skin Fold Thickness

BIA - Bioelectrical Impedance Analysis

BP - Blood Pressure

Transportation of urine samples

Samples will be collected in screw cap bottles and the lids tightly closed and sealed off using tape. Samples will be labeled with the participant's ID, name, time of collection, and dose number, then transported back to the laboratory inside cardboard boxes at room temperature. In the laboratory, smaller samples will be drawn from each sample using a pipette with smaller containers labeled with patient's ID number and as pre- or post-sample. Samples will be stored in the fridge at a temperature of 4 degrees Celsius for one day and then packed and transported at room temperature using the TNT courier service (https://www.tnt.com/express/en_lk/site/home.html) to the Institute of Health and Biomedical Innovation, Brisbane, Australia. Isotope Radio Mass Spectrometry (IRMS) (Hydra 20-2-, SerCon) will be used to measure deuterium isotope levels in urine samples.

Anthropometry

All anthropometric measurements will be taken by a Level 1 Anthropometrist (RJ – also a medical practitioner) trained in accordance with the International Society for the Advancement of Kinanthropometry (ISAK) Level 1 and

some female participants under his supervision with another trained medical officer (YW). All measurements will be taken in accordance with ISAK guidelines (25). Body stature will be measured using a portable SECA 213 (Hamburg, Germany) Stadiometer to the nearest 0.1 cm using the following approach. The participant stands barefoot with feet and heels together and head in the Frankfort plane (achieved when the orbitale® (lower edge of the eye socket) is in the same horizontal plane as the tragion® (the notch superior to the tragus of the ear). When the two landmarks are aligned, the vertex® is the highest point on the skull. The participant will be instructed to take a deep breath while the measurer applies gentle traction alongside the mastoid process. The headpiece will be brought down firmly on the vertex at the same time and the reading will be taken at this point. Body weight will be measured using a SECA 813 electronic scale (Hamburg, Germany) to the nearest 0.1 kg. Male participants will be measured wearing only underwear or light clothes after urinating in the morning and fasting. For female participants, the same procedure will be followed but body weight will be calculated by subtracting the weight of clothing similar to that worn by the participant during the measurement from the measured scale mass of the participant. BMI will be calculated as body weight (kg) divided by the square of height (m).

Waist circumference (WC) will be measured using a tape SECA 201 (Hamburg, Germany) to the nearest 0.1 cm at the midpoint between the lower costal border and the top of the iliac crest, at the end of normal expiration. The technique to be used is briefly outlined here: 1) the tape is held at right angles to the long axis of the body segment being measured; 2) the cross-hand technique is used; 3) constant tension is applied throughout the measurement making sure there is no indentation on the skin but with the tape remaining in place at the designated landmark; 4) the tape is read at eye level to avoid a parallax error. Hip circumference is measured using the same tape to the nearest 0.1cm at the level of the greatest posterior protuberance, perpendicular to the long axis of the trunk with the participant standing with feet together, arms folded across the thorax and without tensing the gluteal muscles.

Skinfold thickness:

Each skin fold measurement is taken in duplicate on the non-dominant side, and the average of two readings recorded following the standard ISAK protocols using a consistent technique and a calibrated Harpenden skinfold calliper (British Indicators, West Sussex, UK).

Biceps skinfold site:

The skinfold measurement is taken parallel to the long axis of the arm at the biceps skinfold site at the point on the anterior surface of the arm in the mid-line at the level of the mid-acromiale-radiale landmark. This point will be located by projecting the mid-acromiale-radiale site perpendicularly to the long axis of the arm around to the front of the arm, and intersecting the projected line

with a vertical line in the middle of the arm when viewed from the front. The participant stands with the right arm relaxed, the shoulder externally rotated, and the elbow extended by the side of the body.

Triceps skinfold site:

The skinfold measurement will be taken parallel to the long axis of the arm at the triceps skinfold site, the point on the posterior surface of the arm, in the mid-line, at the level of the marked mid-acromiale-radiale landmark. This point is located by projecting the mid-acromiale-radiale site perpendicularly to the long axis of the arm around to the back of the arm, and intersecting the projected line with a vertical line in the middle of the arm when viewed from behind. The participant stood with the arm hanging by the side in the mid-prone position and the elbow extended by the side of the body.

Subscapular skinfold site:

The skinfold is measured at the site 2 cm along a line running laterally and obliquely downward from the subscapulare landmark, the lower tip of the inferior angle of the scapula, at a 45o angle. The line of the skinfold is determined by following the natural fold lines of the skin. The participant stands with arms hanging by the sides.

Iliac crest skinfold site:

The skinfold measurement will be taken near horizontally at the iliac crest skinfold site, at the centre of the skinfold raised immediately above the marked iliocristale. The participant stands with the right arm folded across the crest. The measurer places the left thumb tip on the marked iliocristale site, and lifts the skinfold between the thumb and index finger of the left hand. The fold runs slightly downwards anteriorly as the natural fold of the skin.

Supraspinale skinfold site:

The skinfold measurement will be taken with the fold running obliquely and medially downward at the supraspinale skinfold site (the intersection of line from the marked iliospinale to the anterior axilary border, and the horizontal line at the level of the marked iliocristale). This point will be determined by running a tape from the anterior axillary border to the marked iliospinale and drawing a short line along the side roughly at the level of the iliocristale, then running the tape horizontally around from the marked iliocristale to intersect the first line. The fold ran medially downward and anteriorly at about a 45o angle as the natural fold of the skin. The participant stands comfortably with arms hanging by the slides.

Abdominal skinfold site:

The participant stands comfortably with arms hanging by the sides and the skinfold is taken in a vertical fold at the site about 5 cm horizontally from the omphalion to the right. The distance of 5 cm will be assumed as an adult height of approximately 170 cm. The distance will be determined from the actual height by equation: distance (cm) = 5 x height

(cm)/170. As the average height of Sri Lankan adults is around 150-160 cm, this modification will be important.

Medial calf skinfold site:

The skinfold measurement will be taken vertically at the medial calf skinfold site at the maximum girth level. The participant stands with their right foot placed on a box and the calf relaxed. The fold will be parallel to the long axis of the leg and the right knee will be bent at about a 90o angle.

Metabolic parameters

Clinical measurement

Blood pressure will be measured on the study morning using an electronic sphygmomanometer after the participant has rested for five minutes in the seated position. Two seated resting blood pressures will be measured using the Omron automatic blood pressure monitor HEM-7111 (Kyoto, Japan).

Biochemical measurements

Figure 3 shows the procedures to be followed during sample collection, transportation and storage.

All tests will be performed using POINTE 180 Chemistry Analyzer, Pointe scientific, Inc. Canton MI 48188, USA. Serum glucose concentration will be measured using enzymatic colorimetric test for glucose (method with deproteinisation). Alanine aminotransferase and aspartate aminotransferase levels will be performed using liquiUV test. Plasma Total Cholesterol and Triglycerides will be determined using enzymatic colorimetric test for cholesterol with lipid clearing factor. HDL-C will be measured using the cholesterol liquicolor test kit. LDL-C will be determined using the Friedewald formula.

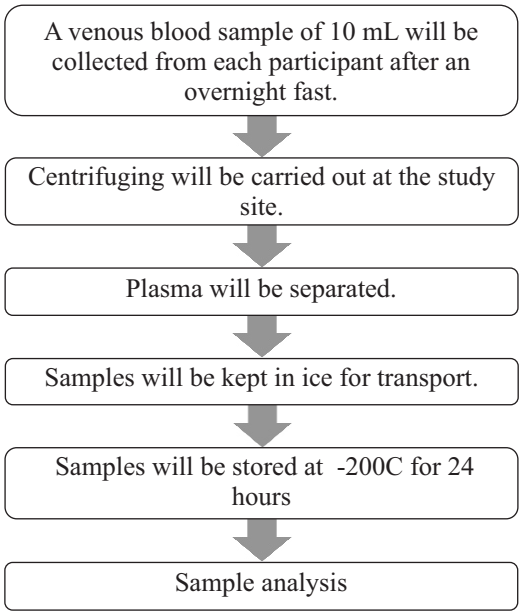

Figure 3: The procedure of sample collection, transportation and storage.

Bioelectrical impedance analysis

Bioelectrical impedance analysis (BIA) will be undertaken using the Inbody 230 (Seoul, South Korea) multi-frequency analyser. The BIA is a segmental impedance device, which uses a tetrapolar 8-point tactile electrode method. Ten impedance measurements will be performed using 2 different frequencies (20 and 100 kHz) at each segment (right arm, left arm, trunk, right leg, and left leg). Participants will remove shoes and socks and wearing light clothing stand on the device while it measures body weight. Thereafter, the participant's identification number, age,

sex, and height will be entered into the machine. Impedance will be measured with the participant standing still and holding hand grips that will be slightly abducted. Data output, as calculated by the manufacturer's algorithm, includes weight, lean body mass, fat mass, total body water, BMI, percentage body fat, basal metabolic rate, segmental lean mass (right arm, left arm, trunk, right leg, left leg), impedance at each segment/ frequency.

Discussion

Sri Lanka is facing the double burden of disease with both over- and under-nutrition having a major impact on the health system. Under-weight and malnutrition among cardiac patients have been reported to be very high (26) whilst conversely, obesity among Sri Lankan adults has reached epidemic proportions (15) having increased several fold during the last two decades (18).

With the global rise in obesity, the accurate measurement of body composition has become increasingly important, including as an invaluable tool in the assessment of cardiometabolic risk. There are significant ethnic differences in body composition with many Asians having a higher body fat percentage at a lower BMI compared to white Caucasians (7). This is particularly the case in the South Asian population (8). Similarly, one of the main contributing factors to the high prevalence of type 2 diabetes among South Asians is obesity (27). Accordingly, WHO has suggested that culturally sensitive BMI cut-offs be used to define obesity in Asian countries (28). A New Zealand study using a small group of young healthy males reported that for a fixed BMI, in contrast to Europeans, Asian Indians had a higher percentage of body fat. Asian Indians had 20% body fat at a BMI of 21 $kg.m^{-2}$, while the Europeans with the same percent body fat had a BMI of 25 $kg.m^{-2}$. Similarly, a predicted body fat percentage (28%) equated to a BMI of 30 $kg.m^{-2}$ for the Europeans whereas it was 25 $kg.m^{-2}$ for the Asian Indians (29). Sri Lankan and Indian guidelines recommended lower BMI values to define both overweight and obesity (30, 31). Our previous work showed that Sri Lankan men and women have a higher risk for cardiovascular diseases at a BMI of 20.7 $kg.m^{-2}$ and 22.0 $kg.m^{-2}$, respectively (32). However, body composition data amongst adults is limited in Sri Lanka. This study will fill a major gap in knowledge regarding body composition and metabolic risk among Sri Lankan adults.

In addition, this study will derive BMI cut-offs to diagnose under-weight in both men and women. BMI values are an essential parameter to diagnose malnutrition in hospital and community settings. For instance, Malnutrition Universal Screening Tool uses BMI of less than 18.5 as the high-risk category (33). Nevertheless, these BMI cut-offs have not been validated for south Asian populations. This study will correlate BMI values and body fat percentages to maintain normal metabolic function in both men and women.

Even though there are several techniques to measure body composition, accompanied by their own specific

strengths and weaknesses, it is hard to select the best tool to measure the adiposity in free living humans. Deuterium dilution technique is the criterion method to measure body water and widely used to estimate adiposity. There, Deuterated (^{2}H) water is used to determine Total Body Water (TBW) by dilution, which allow for the calculation of fat mass as body weight devoid of Fat-Free Mass (FFM) (34). The advantages of D_2O method include, convenience of use because minimal involvement of the participant, and safety as per the substance is not radioactive, consequently making it appropriate for studies involving all the age groups, except only very small children (34). However, the D_2O dilution method requires very sophisticate technology to measure radio isotopes and also the equipment and labour for analyses are expensive (34). Therefore, simple field tools for estimating the body fat are indispensable. Waidyatilaka et al. have validated a skinfold thickness equation (23) and BIA prediction equation (35) for Sri Lankan women but there is no validated tool for the men.

Limitations

The hip circumference will be measured over clothes due to cultural issues and this may be considered a limitation of the study. Moreover, the deuterium level of the two biscuits given to the participants during the wait, between pre and post urine measurements, will not be measured. Nonetheless, because all the participants will be given the exact same amount of biscuits, it may not interfere with the deuterium measurement. Another limitation of this study is that it will not measure the confounding factors of metabolic parameters, particularly, physical activity and nutritional intake of the subjects. Additionally, InBody 230 is dual frequency BIA and it uses 20KHz and 100KHz, but most of single frequency equipment uses 50KHz and our data may not compatible for them. Notwithstanding these limitations, our study will be the first ever to assess body composition of a representative adult sample in Sri Lanka, using the deuterium dilution technique.

List of Abbreviations

BIA	Bioelectrical Impedance Analysis
BMI	Body Mass Index
BP	Blood Pressure
D_2O	Deuterium Oxide
FFM	Fat-Free Mass
FM	Fat Mass
IRMS	Isotope-Ratio Mass Spectrometry
ISAK	International Society for the Advancement of Kinanthropometry
NCDs	Non-Communicable Diseases
SFT	Skin Fold Thickness
TBW	Total Body Water
WC	Waist Circumference
WHO	World Health Organization

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Anatomical variations of the human vermiform appendix in female patients undergoing gynaecological surgeries

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Abstract

Objective

To observe the anatomical variations of the position of the tip of the appendix and its base in females with healthy appendices who undergo laparoscopic gynaecological surgeries.

Methods

The laparoscopic examination of appendices were carried out in 40 subjects who underwent elective laparoscopic gynaecological. The appendices were examined for morphology, mobility, position of the tip, and the position of the base in the caecum, prior to surgical intervention.

Results

Of the 40 females, three were excluded due to presence of adhesions. Out of the remaining 37 healthy appendices, 16 (43.24%) had pelvic appendices while 5(13.51%) had pre-ileal appendices. Post ileal 6 (16.22%), para-caecal 4 (10.8%) retrocaecal 3 (8.11%) and sub-caecal 3 (8.11%) were also detected while no promonteric appendices were found. The base of the appendices were found on postero-medial wall of the caecum in 22 (59.5%), on the postero-lateral wall in 9 (24.3%) and on the lower pole of the caecum in 6 (16.2%) of subjects.

Introduction

The Vermiform appendix is present only in certain species of the animal kingdom including humans, some anthropoid apes and the wombat (1). Lymphoid tissue is the characteristic feature of the true caecal apex throughout the animal kingdom, including, humans. As the vertebrate scale ascends this tissue tends to be collected together into a specially differentiated portion of the intestinal tract. The vermiform appendix of human is not, therefore, either a vestigial remnant of an organ in a state of retrogression, but is an actively functioning lymph gland (2). Vermiform appendix is a narrow vermin tube arising commonly from the posteromedial aspect of the caecum, 2 cm below the iliocaecal valve (3). Small lumen of appendix opens into the caecum and the orifice is guarded by a fold of mucous membrane. The three taenia coli (taenia libera, taenia mesocoli and taenia omental) of the ascending colon and

caecum converge on the base of the appendix (1). The appendix varies considerably in length and circumference. The average length is between 6 to 9 centimeters (3). However some studies show that this range is wider (4). At birth, the appendix is short and broad in its junction with the caecum, but differential caecal growth produces the typical tubular structure by about the age of 2 years.

The appendix is suspended by a small triangular fold of peritoneum, called the mesoappendix, and this is extremely important when blood supply to the structure is considered. Usually the appendicular artery, a branch of the lower division of the ileo-caecal artery supplies the appendix. There can also be a contribution by an accessory artery arising from the posterior caecal branch of the ileo-caecal artery (1,5). Few cases reported stating the existence of other variation of arterial supply can be found (6). Embryologically, the appendix is a direct out pouching of the caecum and is first delineated during the fifth month of gestation. The appendix does not elongate as rapidly as the rest of the colon, thus forming a worm like structure (1,7,8) and this differential overgrowth of the lateral caecal wall results in its medial displacement. Vermiform appendix is a structure that shows extreme variability in its position and morphology compared to the other structures of the body.

Suspected acute appendicitis is the most frequent cause for emergency operations in visceral surgery, worldwide. The lifetime risk of acute appendicitis for men and women is 8.6% and 6.7%, respectively, however, the lifetime risk of having an appendectomy is 12% for men and 25% for women (9). Approximately 15% of the appendisectomies are involved in removal of normal appendices (10).

Varying symptoms of acute appendicitis reflects this variability in its relationship to surrounding structures and it makes the clinical presentation of appendicitis notoriously inconsistent. The percentage of Misdiagnosis of acute appendicitis in different age groups is from 10 to 33% (11).

Most of the studies related to anatomical variations of the appendix have been carried out during appendisectomy done for acute appendicitis. A higher incidence of appendicitis may be associated with a particular position, while inflammation and adhesion formation can alter the natural position of the appendix. Only a few studies have been carried out on normal subjects, using radiological methods such as CT, USS and laparoscopy. No such study is available from Sri Lanka. Therefore it was the aim of this study to observe the anatomical variations of the position of the tip of the appendix and its base in females with healthy appendices who undergo laparoscopic gynaecological surgeries.

Laparoscopic gynaecological surgeries, are perfect for visualizing the appendix with minimal disturbance to the normal anatomy and the awaiting procedure. Further it is a relatively common procedure allowing a considerable number of patients for study.

Methods

Ethical clearance for the study was granted by the ethical review committee of the Faculty of Medicine University of Peradeniya. The study procedure was explained to each patient and written informed consent was sort. No data was collected on those who refused to participate.

Forty patients undergoing elective laparoscopic gynaecological surgeries at ward 18, Teaching Hospital, Peradeniya during the study period were recruited for the study. Indications for the laporoscopic procedures included, laparoscopic dye test for subfertility, diagnostic laparoscopy for suspected ectopics and laparoscopic LRT. Patients with significant abdominal or pelvic masses which may displace the appendix, patients with extensive adhesions within the abdominal/pelvic cavity were excluded from the study.

During the laporoscopic surgery the appendices of each patient was examined before conduction the procedure in order to study the appendix in its undisturbed position (Figure 1). The appendices were examined for their morphology and categorized as normal, inflamed, appendicular mass, or absent appendix. Appendix was examined further for mobility and categorized as, freely mobile, adhered or encased in omentum. Further the position of the tip and position of the base of the appendix in the caecum was noted. The details were entered into a information sheet by the principal investigator and later entered into Excel data sheet. Descriptive statistics were calculated using Excel software.

Figure 1: Intraoperative view of the appendix

Results

Of the 40 females examined, three were excluded due to presence of masses (2 patients) and adhesions (1 patient). The remaining 37 patients had mobile healthy appendices. Out of these patients, 16 (43.24%) had pelvic appendices, while 5(13.51%) had pre-ileal appendices. Post ileal 6 (16.22%), para-caecal 4 (10.8%) retrocaecal 3 (8.11%) and sub-caecal 3 (8.11%) appendices were also detected. There were no promonteric appendices in this sample (Figure 2). The base of the appendices were found on postero-medial wall of the caecum in 22 (59.5%) patients, on the postero-lateral wall in 9 (24.3%) and on the lower pole of the caecum in 6 (16.2%) of the patients. (Figure 3)

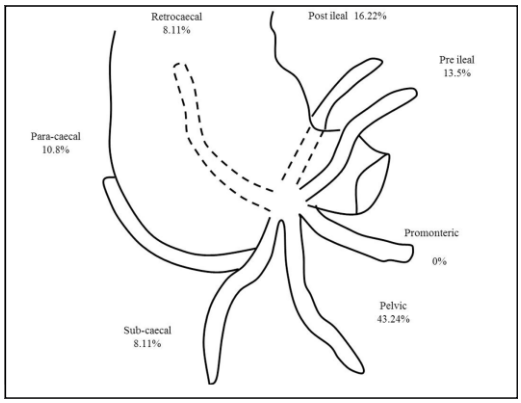

Figure 2: Positions of the tip of the appendix

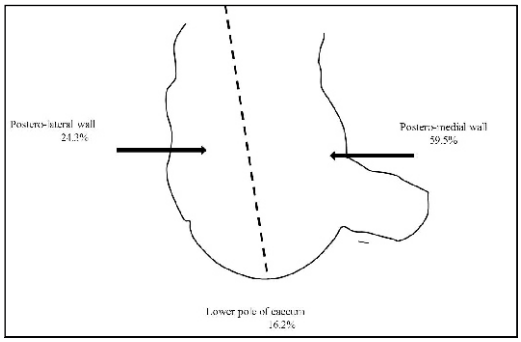

Figure 3: Position of the base of the appendix

Discussion

Although retrocaecal position of the appendix is considered to be the commonest position of the tip of the appendix in literature (1,12,13) the pelvic position was detected as the commonest position among this group of healthy female subjects who underwent elective laparoscopic surgery. Similar findings have been reported by Ahmed et al (2007), where they report the pelvic position to be the commonest position observed during laporoscopic surgeries (14). Ojeifo et al (1989) report that in Nigerians the pelvic position is the commonest in healthy appendices while the retroceacal becomes commoner in appendicitis (15). In a study done in India on healthy individuals who underwent CT scan of the abdomen the appendix was commonly found in the pelvic position (16). In a study done by the same authors on cadavers in Sri Lanka the post ileal position was found to be the commonest with the retroceacal coming second (17). Most studies done on autopsies or cadavers report the tip of the appendix as being either in the retrocaecal or post ileal position (1,12,13,17,18).

The base of the appendix was commonly located at the postero- medial wall of the caecum as described in literature, followed by postero-lateral wall and the lower pole of the appendix. In the majority of the studies done using different techniques such as cadaveric or radiological the appendix base is reported as being in the same three positions and do not differ according to the method used.

Even though the position of the appendix has been extensively studied for many years the findings reported by different teams differ greatly according to race and also according to the methods used for detection. Due to the many varied clinical presentations of acute appendicitis the position of the tip is clinically important in diagnosis and management of these patients. According to our studies and the available literature it seems possible that the appendix changes its position giving rise to different findings when different methods are used and further to the wide range of clinical symptoms observed in clinical practice.

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Running title

position of the appendix during surgery

Laparoscopic assisted left hemicolectomy and left nephrectomy - case report

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Introduction

The objectives of surgery for colonic cancer are to achieve an adequate resection margin and removal of involved lymphatics (1). Minimal access surgery is an acceptable alternative to open surgery for colon cancer with the additional advantages of decreased postoperative pain, shorter hospital stay compared to open surgery (2).

About 10% to 20% of colon cancer develops local invasion to nearby organs (3). Out of them renal involvement is rare (4). Laparoscopic assisted surgery for locally advanced colonic tumor is achievable though it remains controversial. Only few studies are available to show its feasibility and similarity of oncologic outcomes to those of an open approach (5).

Case History

A 42-year-old female presented with left sided abdominal pain and constipation for 1 year duration and rectal bleeding mixed with stools for 6 months. A non-ballotable mass was palpable in the left lumbar region. Although colonoscopy revealed a circumferential lesion in the descending colon, biopsies did not show evidence of a malignancy or inflammatory bowel disease. Computerized tomogram showed a tumour in the descending colon invading the left kidney. Further investigation revealed that the involved kidney was nonfunctioning.

The management was discussed at multi-disciplinary meeting and laparoscopic assisted en-bloc resection was planned and informed consent obtained.

Surgery was done under general anaesthesia. The patient was placed in Llyod-Davis position with head low and tilted to right. Five ports including camera port was used. Initially inferior mesenteric artery and vein were dissected ligated and divided. Next the renal artery and vein were dissected, ligated and divided. Ureter was divided close to pelvic brim. Sigmoid colon was then mobilized. Proximal colon was mobilized up to mid transverse colon. The entire specimen was mobilized en-block from retroperitoneum. A mini-laparotomy was performed, bowel ends were divided and specimen removed using a wound protector. Extra-corporeal anastomosis performed.

Post-operative pain was managed with epidural on the first day and subsequently with oral analgesics. She was mobilized out of bed from first post-

operative day. Oral liquids were commenced from next day and a normal diet by the fifth day. She had no complications and discharged from hospital on the fifth post-operative day.

Histopathology revealed moderately differentiated mucinous adenocarcinoma of the left colon (pT4bN1Mx) with infiltration of left kidny. She was referred to the oncology unit for chemoradiotherapy.

Figure 1: Mini laparotomy incision made for retrieval of specimen and bowel anastomosis

Discussion

The retroperitoneal structures are more likely to be invaded by tumors located at the hepatic and splenic flexures, ascending and descending colon (3). Direct invasion of kidney from a primary colon cancer is rarer than renal metastasis from colon cancer. Renal fascia of Gerota play an important role in preventing the spread of disease between the perirenal space and the extra peritoneum (4,6).

In locally advanced tumor, complete resection is required for long term survival. Therefore, pre-operative identification of organ In locally is required for long term survival. Therefore, pre-operative identification of organ involvement from symptoms, signs and imaging is important.

In this case, she did not have symptoms such as loin pain or hematuria that indicate renal involvement. Contrast enhanced computerized tomography showed direct tumor infiltration to the left kidney and differential functional studies revealed non functioning of the involved kidney. Any attempt to dissect a macroscopically infiltrating tumor from the surrounding is strongly discouraged and increased 5-year survival rates are shown if spillage is avoided by en-bloc resection (7).

Laparoscopic assisted colectomy is a well-established alternative to open surgery for colon cancer. Laparoscopic approach shows statistically similar rate of tumor recurrence, wound implantation, and overall survival at 3 years. Laparoscopic resections are associated with decreased postoperative pain and shorter hospital stay compared to open surgery (2,8). However, minimal access surgery for locally advanced tumor remains controversial. The arguments raised are incomplete resection of tumor, high conversion rate and surgeons experience (5). Only few studies are available to show the feasibility and the effectiveness of laparoscopic assisted surgery for locally advanced disease (5,9,10,11). In the patient discussed an en block left

hemicolectomy and left nephrectomy was completed laparoscopically. Specimen retrieval and anastomosis was performed by a mini laparotomy.

Conclusion

En bloc colonic resections with locally infiltrated organs can safely be performed laparoscopically after evaluation of imaging.

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Key words - Laparoscopy, en bloc colectomy

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1. A concise but informative title
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Original and review articles must contain an abstract of approximately 250 words with four specified subtitles:

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2. Material and methods: A description of experimental procedure including applicable statistical evaluation.
3. Results: A summary of the new; previous unpublished data and results.
4. Conclusion: A statement of the study's conclusion 3-5 key words according to Index Medicus should be provided.

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The introduction should carry sufficient background information on the subject of study.

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Procedures should be described in such detail as to make it possible to repeat the work. Subheadings may be used to improve clearness. Correct unit abbreviations should be used (e.g. “h”, “min”, “s” and “Fm” rather than “hr”, “minutes”, “sec” and “FI” respectively). The authors should consider the ethical

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The results section should clearly and concisely present the findings of the research, as a rule in the past tense without subjective comments and reference to previous literature. The results should be supported by statistical or illustrative validation. For the sake of clarity this section may have subheadings.

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All graphs, drawings, and photographs are considered figures and should be numbered in the order of appearance in Arabic numerals. Each figure should have a brief and specific legend, and all legends should be typed together on a separate sheet of paper. Photographs should be glossy prints and the reverse should give the figure number, title of paper, principal author's name and have a mark indicating the top. Colour illustrations may be submitted in instances where their use may contribute significantly to the scientific value of the article. Colour illustrations may be printed free of charge at the Editor's discretion, whereas others may be printed at the author's expense.

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Examples of correct forms of references are given below. These are based on the format used in the Index Medicus.

Abbreviate journal names according to the /list of Journals Indexed, printed annually in the January issue of Index Medicus. List all authors; do not use et al in the reference list.

Journals

Standard journal article

Bartlett IG, O'Keefe P. The bacteriology of the perimandibular space infections. JOral Surg 1979; 37: 407-409. 64

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.

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Abstracts

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The lateral thoracic vein as a guide to the thoracodorsal pedicle

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Introduction

Accurate anatomical landmarks to locate the thoracodorsal pedicle (TDP) are important in axillary clearance and reconstructive surgery.

Materials and Methods

Twenty axillary dissections were carried out on preserved Sri Lankan cadavers. Cadavers were positioned dorsal decubitus with upper limbs abducted to 900. An incision was made in the upper part of the anterior axillary line. The lateral thoracic vein (LTV) was identified and traced bi-directionally. The anatomical location of the TDP was studied in relation to the lateral border of pectoral is minor and from a point along the LTV, 2 em inferior to its confluence with the axillary vein (reference point x).

Results

The LTV was invariably present in all the specimens. All the LTV s passed lateral to the lateral border of pectoralis minor except in one specimen, where the LTV passed along its lateral border. The TDP was consistently present posterolateral to the LTV The mean distance to the LTV from the lateral border of pectoralis minor was 28.7±12.6 mm. The mean horizontal distance, depth.and displacement, from reference point x to the TDP were 14.5±8.9 mm, 19.7±7.3 mm and 25±5 mm respectively. The TDP was found in a posterolateral direction, at a 540±120 angle to the horizontal plane, 95% of the time.

Discussion and Conclusions

The LTV is an accurate guide to the TDP. We recommend exploring for the TDP from a point 2 em from the confluence of the LTV and the axillary vein for a distance of 25±5 mm in a posterolateral direction, at a 540±120 angle to the horizontal plane.

Keywords

thoracodorsal pedicle, lateral thoracic vein, anatomical landmark, axillary clearance

Morphological variations of the human ejaculatory ducts in relation to the prostatic urethra: a cadaveric study

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Introduction

Loss of ejaculation is common following transurethral resection of prostate (TURP). Preservation of periverumontanal prostate tissue is practiced in ejaculation preserving TURP (ep- TURP). Anatomical knowledge of the relationship of the ejaculatory ducts to the prostatic urethra can aid in ep- TURP. The study evaluated the anatomical relationship of the ejaculatory ducts and prostatic urethra in cross sections using a 3D model to determine a safe zone to resect the prostate in ep- TURP.

Materials and Methods

A 3D reconstruction of the ejaculatory ducts was developed based on cross sections of six cadaveric prostates. The measurements obtained on the 3D model were standardized according to the maximum width of the prostate. Simple linear regressions were conducted to predict the relations of the ejaculatory ducts.

Results

Maximum width of the prostates ranged from 22.60mm to 52.1 Omm. The ejaculatory ducts entered the prostate with a concavity directed posterolaterally. Then they ran towards the verumontanum in a fairly straight course and angulated anteromedially at the verumontanum. As they opened into the prostatic urethra they diverged. Significant regression models were found to predict the relations of the ejaculatory ducts to the prostatic urethra based on the sizes of the prostates.

Discussion and Conclusions

The 3D anatomy of ejaculatory ducts can be predicted based on the width of the prostate. The ejaculatory ducts can be preserved with 95% accuracy if a block of tissue 7.5 mm from the midline on either side of the verumontanum is preserved, up to lOmm proximal to the level of the verumontanum during TURP.

Keywords

ejaculatory duct, prostate, ejaculation, TURP

Morphometric study of distal humeri in Sri Lankan population

Wijesundara WMCS[1], Niluka DHM[1], Madushika R[1], lndunil LA[1], Deegodagamage YS[1], Edirisinghe ESSR[1], Yasawardene SG[1], Dissanayake PH[1]

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Introduction

Increasing incidence of comminuted osteoporotic distal humeral fractures will resulti n greater utilization of elbow arthroplasty as a management option in future.

In forensic anthropology, humeral osteometryis important in estimating height of an individual. Although there are few studies done on the above subject, there is minimal published data available for Sri Lankan population.

This study was conducted with the aim of gathering osteometric measurements of distal humeri in Sri Lankan population.

Methods

Forty-eight (left 28: right 20) humeri, donated for teaching and research purposes to Department of Anatomy, University of Sri Jayewardenepura were analyzed. Humeri were stabilized in anatomical position by a fixator board. Measurements were taken by a digital Vernier calliper in millimetres up to 2 decimal points by two independent individuals and mean value was taken.

Results

Mean distance between the most distal and most proximal points along the edge of olecranon fossa(PQ) was 18.70 ±2.35mm [right side-18.83±2.14mrn and left side-18.60±2.52mrn]. Majority ranged between 19.00-20.99mm(14/48).

Mean distance between most distal point of trochlea and most distal end of olecranon fossa(RS) was 16.44±1.95mm [right side-15.82±1.75mm and left side-16.89±2.00mm]. The majority ranged between l5.00-l6.99mm(17/48).

Discussion and Conclusions

Analysing distal humeral morphometry becomes important in the field of orthopedic surgery when reconstructing comminuted distal humeral fractures.

These measurements will be useful in forensic and archeological fields to identify unknown bodies. Above osteometric measurements can be used to create reference ranges for Sri Lankan population which will be beneficial in surgical, forensic and archeological fields.

Maximum deviation of the marginal mandibular nerve from the inferior angle of the mandible: a Sri Lankan cadaveric study

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Introduction

The marginal mandibular branch of the facial nerve (MMBFN) is vulnerable to iatrogenic injuries during surgeries involving the submandibular region. This leads to significant post operative morbidity. Studies assessing accurate anatomical landmarks of the MMBFN are sparse in South Asian countries. Present study was conducted to assess the relationship between the MMBFN and the inferior border of the body of mandible.

Materials and Methods

Twenty two preserved cadavers of Sri Lankan nationality were selected. Cadavers were positioned dorsal decubitus with necks in extension. The maximum perpendicular distance between the inferior/caudal most ramus of the MMBFN and the inferior border of the body of the mandible was recorded on both hemifaces.

Results

Recorded maximum distance was 17.65 mm on left side and 10.80 mm on right side. Mean maximum distance, was 7.12 ± 2.97 mm. There was no statistically significant difference in the maximum deviation on left (7.84 ± 3.41 mm) and right sides (6.44 ± 2.37 mm); p>.05.

Discussion and Conclusions

Course of the marginal mandibular nerve is complex. If the distance of the incision in the posterior submandibular approach is less than 2 em from the inferior border of the mandible, there is a high probability of damaging the inferior ramus of the MMBFN.

Key words

Marginal mandibular branch, facial nerve, mandible, submandibular incision

A new surface landmark for the digital nerves

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Introduction

The purpose of this study was to identify surface landmarks of digital nerves corresponding to depigmented/ pigmented border of digits.

Materials and Methods

A total of 140 digital nerves in fourteen preserved adult cadaveric hands were dissected under magnification. Distance to each digital nerve from depigmented/ pigmented border of digits was measured along the circumference of the finger at the metacarpophalangeal crease.

Results

The digital nerves were constantly located anterior to the depigmented/ pigmented border. The mean distances between this border and the digital nerves on radial and ulnar aspects of the digits were: thumb (5.37 ± 1.42 mm, 5.08 ± 1.57 mm), index finger (4.99 ± 1.65 mm, 6.14 ± 1.74 mm), middle finger (5.31 ± 1.44 mm, 5.14 ± 1.66 mm), ring finger (4.99 ± 1.44 mm, 4.47 ± 1.76 mm) and little finger (5.01 ± 1.16 mm, 4.32 ± 1.52 mm) respectively. The mean of cumulative distances between the depigmented/pigmented border and the digital nerve was 5.08 ± 1.57 mm. There was no statistically significant difference of these distances between either sides of the digits or among the digits; $p>.05$.

Discussion and Conclusions

Depigmented/pigmented border of digits is a reliable anatomical landmark to locate digital nerves.

A new surface landmark for the digital nerves

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Introduction

Advanced level (AIL) examination is the culmination of school education and a major deciding factor for future education and employment. Since transition from school to University may be difficult, we aim to analyze the attitudes and practices among students with regard to education.

Materials and Methods

AIL biology students attending the human biology workshop were recruited. Consent was obtained and the questionnaire was administered after the workshop.

Results

A sample of 100 students (65 male 35 female) aged 17.78±0.74 from Central, Sabaragamuwa and Uva provinces were recruited. 68% had chosen biology because of better job opportunities. 98% wanted to enter the medical faculty. Majority (83%) studied from notes, 13% read text books. 7% used the internet to learn, 30% engaged in peer group discussions, 98% took private tuition but only 50% thought that it was essential. 96% were aware that the teaching in the University was different and of the importance of self-studying.

Discussion and Conclusions

A majority wish to join the medical faculty for better job opportunities. Students prefer studying from notes to reading text books which may become a problem at university. A minority use internet for learning, which is of concern since universities employe-learning. Majority take private tuition however it's interesting to see that only half think it's essential. Majority are aware that self-studying is a must in the university. Schools are recommended to increase students' awareness of the internet as a learning resource arid encourage them to read text books and engage in peer group discussions.

Morphometric study of proximal humeri in a Sri Lankan population

Niluka DHM[1], Wijesundara WMCS[1], Madushika PKK[1], lndunil LA[1], Deegodagamage YSJ[1], Edirisinghe EAST[1], Yasawardene SG[1], Dissanayake PH[1]

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Introduction

Humeral head diameter (HHD) and angle of inclination (AI) are important parameters during shoulder reconstruction and prosthetic replacement while differences in placement of the greater tuberosity can have an impact on postoperative range of movement.

In forensic anthropology, humeral osteometric measurements are important in estimating height of an individual.

There is minimal data available in Sri Lankan population on above subject.

Methods

Forty-eight (left28:right20) humeri, donated for teaching and research purposes to Department of Anatomy, University of Sri Jayawardenepura were analyzed. Humeri were stabilized in anatomical position by a fixator board. Measurements were taken by a digital Vernier calliper in millimetres up to 2 decimal points by two independent individuals and mean value was taken. Angle ofinc1ination was measured by 360° Dial Universal Bevel Protractor.

Results

HHD was 42.24±3.7mm. Majority (60.4%[29/48]) ranged between 41-46mm. Left HHD had twice the standard deviation (42.14±4.32mm) than right (42.39±2.87mm).

Mean distance between most proximal points on humeral head and greater tuberosity (AB) was 4.93±1.62mm[right side-5.1O±1.73mm and left side-4.81±1.56mm].'Majority 52% (25/48) ranged between 4-6mm.

AI ranged from 104.55°-149.05° and mean was 131.5°±6.910 [right side 131.5°±6.910 and left side-130.210±8.42°].

Majority(37.5%[18/48]) of Humeral length(HL) was between 300-340mm. Mean was 307.90±16.50mm[right side-308.30±15.90mm and left side-307.50±17.2mm]

Discussion and Conclusions

These measurements are important in cases of proximal humeral fractures, which extend along the epiphysial lines of the proximal humerus and its segments, causing their displacement to various degrees and in the fracture management.

The study also helps in forensic and archeological fields to identify unknown bodies and to create reference ranges for Sri Lankan population.

Unilateral three-headed biceps brachii: a case report

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Introduction

Numerous variations with regard to the number of heads of the biceps brachii muscle have been reported. Knowledge on these variations can be vital during surgeries and interpreting images of this region to distinguish structures from one another.

Case report

During routine dissection of a male cadaver at the Department of Anatomy, a variation of the right biceps brachii muscle was identified. In contrast to the normal pattern of having two heads, the right biceps brachii muscle was comprised of three heads. The long head (LH) was identified with its origin at the supraglenoid tubercle, while the short head (SH) arose from the coracoid process. The supernumerary head of the biceps brachii muscle was noted to be originated from the medial surface of the shaft of the humerus. The three heads formed a common tendon which inserted to the radial tuberosity. The rest of the musculature did not reveal further variations.

Discussion and Conclusions

The biceps brachii muscle and the structures in the vicinity are a common area of the body with numerous anatomical variations. Among these, the three-headed biceps brachii is a fairly common finding. A superior supernumerary head of the biceps brachii muscle was identified on a male cadaver signifying the presence of numerous anatomical variations in the arm.