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Department of Anatomy,
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Correspondence regarding editorial matters, articles, reviews and news items regarding the membership should be addressed to the Editor, SLAJ, Dr. Harsha Dissanayake, Department of Anatomy, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka.

E-mail -
anatomicalsocietysrilanka@gmail.com

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EDITORIAL

Method of body conservation; Is it time to review?

Formalin is a conventional chemical used for body preservation. It is the aqueous form of formaldehyde. Therefore, its use is not confined to cadaveric conservation but also as a powerful disinfectant. Formaldehyde is made out of methane. Forest fires, automobile exhaust and tobacco smoking releases methane which gets oxidized and combined with other carbonic compounds to get converted to formaldehyde. However, Formaldehyde is volatile especially when exposed to direct sunlight. Interestingly, formaldehyde is made within the human body in minute amounts by oxidizing amino acids. Further, formaldehyde has also being discovered in outer space. The property that helps formaldehyde to act as a tissue fixative and as an embalming agent is its nature to form cross bonds with amino acids.

Even though traditionally formalin was used to preserve bodies worldwide, now most of the countries have raised concerns or stopped using formalin due to its carcinogenic property. Embalming solutions containing formalin have formaldehyde emissions. These can easily enter the lungs via inhalation. It had been measured even a smaller quantity such as 0.1 ppm can trigger, headaches, watery eyes, burning throat and difficulty in breathing. People who are exposed for a long time may develop nasopharyngeal carcinoma, leukemia. It would be very interesting if a prospective study could be done to see the effects on health by chronic exposure to formalin among people doing embalming, who manufacture goods using formalin, staff of Departments of Anatomy etc. in Sri Lanka.

Currently, there are multiple commercially prepared solutions for body preservation where a very low or no formalin is used. In 1978 Bradbury and Hoshino published their solution made up of Formaldehyde, Phenol and monoethyl glycol. This allowed some flexibility of the cadaver but individual organ preservation especially the brain was not satisfactory. Later Frolich et at(1984), Frewein et al.(1987), Ikeda et al. (1988) published similar solutions to Bradbury and Hoshino but they used Ethanol instead of Methanol andreplaced monoethyl glycol with glycerine and chloral hydrate with propylene glycol.

In 1992 and 2002 Thiel published a more environmental friendly solution containing water, formaldehyde, 4-chloro-3-methylphenol, morpholine and propylene glycol. The cadavers had better colour preservation and allowed tissue and joint mobility, however, the muscle tissue was disintegrating and was expensive.

Barton et al. omitted formaldehyde and only used water, Ethanol, Phenol and Glycerine. Hammer et al. (2012) used ethanol, glycerin and thymol but there isn't adequate data on suitability for dissections. Shi et al.(2012) replaced formaldehyde by hydroxymethyl

phosphonium chloride which has the additional fungicide properties. Literature suggest that this solution can keep the cadavers preserved for 2 years. However, the ability to do dissections is not clear. Further, studies are available using different preservation solutions but the suitability of such preserved bodies for dissections is unclear. Some of the identified problems were lack of a continuous supply, expensive and high tendency for fungal growth.

The "Cresando" mix is a formula by the Otago University, New Zealand. Here, the phenol is replaced by phenoxitol, hence, the cadavers have less odor. Nevertheless, we need more data to conclude whether it is the ideal body preserving solution for us.

Plastination is another novel method of body preservation where the body water and fat is replaced by silicone resins or epoxy polymers. This is an very advanced way method of body preserving bodies as the cadavers are odorless, more durable, can be touched but less flexible and make it not suitable for dissecting. However, plastination is a method that could be used to preserve dissected specimens for a long time allowing some amount of tissue mobility and it is very suitable to be used in prepairing museum specimens. The plastinized specimens could be just left in room temperature and the students could handle the specimens and learn anatomical structural relations. However, it is an expensive process and tissue dissection would not be possible after plastination, hence, making it more suitable for prosected specimens but unsuitable to carry out dissections.

In conclusion, I firmly believe that it is time for us to review the body preservation processes and minimize the formalin usage. Multiple body preservation methods could be adopted within the Departments of Anatomy to serve different purposes and thereby reduce the formalin usage. Body coolers using low temperatures could be used to store prosected specimens which are used for practical examinations. Measuring the amount of hazardous chemicals in our dissection halls when using the standard high formalin concentrated formula need to be done in a routine manner and pay more attention to improve the ventilation and maintain a free air flow across the dissecting halls. Let's initiate collaborative research and find the best preservation solution to fit our country considering the cost, availability of ingredients, temperature, storing facilities and the purpose and it may even require the usage of multiple methods of preservation to serve different purposes.

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Dr. Sithara Dissanayake,
MBBS (Col), MD (Otorhinolaryngology), DOHNS (UK)
Senior Lecturer/ Consultant ENT Surgeon,
Department of Anatomy,
Faculty of Medical Sciences,
University of Sri Jayewardenepura,
Gangodawila,
Nugegoda.

LETTERS TO THE EDITOR

The usefulness of detection of sex chromatin in babies with uncertain sex in resource limited settings

Amaratunga HA[1], Dissanayake JK[1], Wijeratne AGG[1]

[1]*Department of Anatomy, Faculty of Medicine, University of Peradeniya, Peradeniya, Sri Lanka*

Ambiguous genitalia in a new born baby is a major problem to the health care worker as well as the family of the affected (1). To minimize psychosocial problems that may arise in the families of affected babies, early detection and quick determination of the sex of the individual is essential (1, 2). The gold standard for such cases in karyotyping, and this may pose a problem since access to chromosomal analysis is not readily available to all institutions. Identification of sex chromatin is a simple first line investigation that can be used in resource limited settings. The term 'sex chromatin' is used to describe two structures namely the Barr body, present in epithelial and other tissue cells and the drumstick chromosome of the polymorphonuclear leucocytes (3,4,5). The Barr body was described by Dr. Murray Barr in 1949 and is produced by the inactivation of the X chromosome as explained in the Lyon hypothesis (3, 6). Drumstick chromosome is also produced by the same inactivation mechanism but is seen in 3 out of 100 circulating neutrophils in the blood of normal females (4). The Barr body examination in a buccal smear and identifying the drumstick chromosome in a peripheral blood smear are relatively simple and inexpensive tests and can give the clinician an idea about the chromosomal sex of the baby when karyotyping is unavailable.

A sample of 18 babies with ambiguous genitalia referred to the department of Anatomy University of Peradeniya, for detection of sex chromatin from January 2006 to August 2009 was examined. Babies were examined for phenotypic characteristics of their genitalia and categorized into male type or female type according to the Prader staging system characteristics (7). Size of the clitoris or phallus and labioscrotal separation was taken as deciding factors.

A smear from the buccal mucosa was obtained and stained with basic fuchsin and a drop of blood obtained by heal prick was stained with Giemsa. Prepared smears were examined under light microscopy for the presence of Barr bodies and the drumstick chromosome.

Babies referred were between the ages of 5 days and 2 years with the majority being less than 1 month of age (72%).

It was observed that the defects in the genitalia had been detected at birth in all babies, and that health personal had explained the problem to the parents. However it was seen that the parents had formed their own opinion and had named their babies giving them what appeared to be the most likely gender.

Eleven of the babies had female type external genitalia. Nine of these babies were positive for Barr bodies and the drumstick chromosome. Seven of these had a probable diagnosis of adrenal hyperplasia after hormone essays, suggesting a female genotype with virilised female external genitalia. Congenital adrenal hyperplasia is known to be the commonest cause for ambiguous genitalia worldwide (8). One of these babies had multiple congenital anomalies consisting of ventricular septal defect, extra digits in the hand and abnormal palmar creases. This child was being investigated for a syndrome. The other child had normal hormone levels but a uterus had not been detected at ultrasound and was scheduled for further investigations.

Out of the babies with female type genitalia two babies were negative for Barr bodies and the drumstick chromosome. One of these babies could be having Turner's syndrome while the other who had male levels of testosterone could be insensitivity to male sex hormones but require further investigations for a definitive diagnosis.

Five babies with male type external genitalia had negative Barr bodies and drumstick chromosomes, suggesting a male genotype. Out of these none had palpable testes and ultrasound examination had not been able to detect the testes in the abdomen most probably due to the young age of the babies. These babies are likely to be having hypospadias with undescended testes with or without sex hormone imbalances. One of these babies also had Downs syndrome with the typical facis and a atrial septal defect.

One baby was identified as having few cells with clear Barr bodies and few cells with drumstick chromosomes. On examination the baby had male type external genitalia, but a uterus had been identified on ultra sound. This could be a case of mixed gonadal dysgenesis which is known to be the second most common cause (9).

Ambiguous genitalia appear to be detected at birth by health professionals. Congenital adrenal hyperplasia is the commonest cause for ambiguous genitalia in this sample. It can be stated that Barr body and drumstick chromosome analysis give good supportive evidence in deciding the sex of babies with ambiguous genitalia in resource limited settings where karyotyping maybe unavailable.

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REVIEW ARTICLE

Neuroregeneration, neurodegeneration and brain recovery following ischaemic stroke: a comparative review of animal models and humans

Mathangasinghe Y[1]

[1]*Department of Anatomy, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka*

Abstract

Stroke is a leading cause of healthcare burden in the aging population with a rapidly rising prevalence worldwide. Ischaemic strokes account for 85% of the strokes. The key to recovery of brain functions following an ischaemic stroke depends on two arms: 1) restoration of lost or damaged neurones and, 2) survival of neurones that were not killed by the injury. Hence, the recovery could be hastened by promoting neuroregeneration and preventing neurodegeneration. During the last five decades, animal models showed promising results in the field of neuroregeneration, which was long believed to be impossible. Furthermore, animal studies with stroke lead to the discovery of the novel concepts of epigenetic inhibition in nerve growth, upregulation of apoptotic genes, neuroinflammation and metabolic dysregulation which contributed to neurodegeneration. However, it is debatable if these findings can be replicated in human brains, in order to develop potential therapeutic strategies.

Keywords

stroke, nerve regeneration, nerve degeneration, neurogenesis

Main Article

Stroke is defined as an acute brain insult due to a vascular event leading to permanent injury to neurones and functional compromise [1]. Strokes are caused by inadequate blood supply to the brain to meet its metabolic demands. They can be classified into two major sub groups based on the pathophysiology: ischaemic and haemorrhagic. Ischaemic strokes occur usually secondary to occlusion of a cerebral blood vessel [1]. Ischaemic strokes are by far the commonest type worldwide accounting for 85% of the strokes [1]. The Global Burden of Disease study concluded that ischaemic strokes account for 2 690 200 deaths in the world in 2016 [2]. The incidence of stroke in Asia is 116 to 483 per 100 000 per year [3].

Mechanisms of recovery from ischaemic stroke

The key to recovery of function following a stroke depend on two arms: 1) restoration of lost or damaged neurones and, 2.) survival of neurones that were killed by the injury. The mechanism of restoration of the lost or damaged neurones is by means of repair and regeneration. The repair of damaged long axons within the central nervous system is markedly limited, particularly

due to the active inhibition of axonal regrowth by the glial cells [4]. Conversely, the belief of inability of neurones to regenerate was challenged in recent studies.

Neuroregeneration

Altman in 1962 first described the neurogenesis in adult mammalian brain [5]. In 1998, Eriksson and colleagues found that the neurogenesis happens in the dentate gyrus of the adult human hippocampus [6]. Adult hippocampal neurogenesis declines with aging in rodents [7] and non-human primates [8]. There are striking differences of neurogenesis between humans and animals. Neuronal migration from subventricular zone to olfactory bulb along the rostral migratory system could only be demonstrated in rodent [9, 10] and non-human primate [11, 12] studies. Whereas, unique features like striatal neurogenesis was not demonstrated in animal studies [13, 14]. Likewise, there is conflicting evidence whether neurogenesis happens in the normal adult brains [15-18]. Using immunofluorescence staining, Sorrells and colleagues concluded that neurogenesis in humans rapidly declines from 7 to 13 years of age and it is almost non-existent in the adult age [19]. Despite adapting a fairly similar methodology, Boldrini and colleagues found that the neurogenesis persists in adult human brain even until the eighth decade of life, even though the quiescent neural stem cell population, neural plasticity and angiogenesis declines with aging process [20]. The contrasting evidence by these two landmark studies proves that understanding of the mechanism of adult neurogenesis is far from clear.

Similarly, the mechanism of neuroregeneration following ischaemic stroke is poorly understood. A few studies investigated the patterns of neuroregeneration following a stroke. Radiocarbon-14 dating studies failed to show neuroregeneration in forebrain following stroke [21], whereas immunocytological studies demonstrated a possible neurogenesis with migratory phenotype [22-24]. Few in vitro and in vivo studies elicited that the neurogenesis is co-regulated with angiogenesis [25-28]. An age associated decline in both angiogenesis and neuronal plasticity was found in a human study [20]. However, correlations of neuroregeneration and angiogenesis in humans are not reported.

Neurodegeneration

Ischaemic damage to the brain initiates a cascade of events which leads to death of partially injured neurones leading to neurodegeneration. Transcriptomic analyses of ischaemic penumbra of rats provided insight into temporal relationship of differential expression of genes responsible for metabolic, inflammatory and immunological pathways in post-ischaemic neurodegeneration [29]. Subsequent animal studies with stroke lead to the discovery of the novel concepts of epigenetic inhibition of axonal sprouting [30], extensive upregulation of apoptotic genes [29], neuroinflammation [31] and metabolic dysregulation [32]. However, genes which prevent inflammation [33,

34] and oxidative stress [35] after ischaemic stroke were also discovered. Nevertheless, controversial results against the apoptosis and gene fusion following stroke were found in a human study [21].

Conclusions

Nerve regeneration and degeneration may play a critical role in the recovery of stroke. However, we cannot ascribe the results of neuroregeneration and neurodegeneration found in animal models directly to humans. Human studies are scarce due to lack of access to tissues and technical problems of tissue handling and sequencing. Therefore, there are ambiguities and gaps in knowledge of the dynamic balance between protective and damaging factors leading to post-ischaemic neuroregeneration and neurodegeneration in humans.

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Conflicts of Interests

The authors declare that there are no conflicts of interests.

RESEARCH ARTICLES

Morphological Evaluation of Cephalic Phenotypes in Purana (old) Inhabitants at Sigiriya Suburbs, Sri Lanka

Chandimal, K.M.[1], Adikari, G.[2], and Yasawardene, S.G.[3]

[1]*Department of Anatomy, Faculty of Medicine, Wayamba University of Sri Lanka*

[2]*Postgraduate Institute of Archaeology, University of Kelaniya, Sri Lanka*

[3]*Department of Anatomy, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka*

Abstract

This study was designed to determine the cephalic phenotypes of adult *Purana* (ancient) inhabitants living in the suburbs of Sigiriya, Sri Lanka, whose ancestry goes back to, the times of Sinhalese Kings, 5th century A.D. (1,450 YBP). One hundred and seven adult male and 206 female individuals belonging to *Purana* pedigree without craniofacial deformity were used as primary samples for the study. The head length and breadth were measured accordingly to the standard procedures as described in the literature and cephalic index and cephalic phenotype were determined for each individual. The study revealed that mean head length (18.2 cm) and mean head breadth (14.4 cm) of male were significantly higher than mean head length (17.5 cm) and mean head breadth (13.9 cm) of female, respectively ($P < 0.05$). The mean cephalic index was 79.40 in male and 81.00 in female. The dominant type of cephalic phenotype in male was mesocephalic (41%) followed by brachycephalic (29%), dolicocephalic (20%) and hyperbrachycephalic (10%). In females, dominant type of cephalic phenotype was mesocephalic (34%) followed by brachycephalic (32%), dolicocephalic (17%) and hyperbrachycephalic (17%). The common cephalic phenotype of the *Purana* population, irrespective of gender, was mesocephalic (35%). The data of the study will be useful to anthropologists, anatomists and forensic experts etc.

Keywords

Anthropometry, Cephalic Index, Cephalic Phenotypes, *Purana* Population, Sigiriya

Introduction

Geographical variation in anthropological traits, both quantitative and qualitative, of the populations is analyzed in current studies. Racial and ethnic affiliation, climatic, socio-economic, nutritional and genetic influences are known determiners of the craniofacial morphologies found in *Homo sapiens* (Bass 2005). The craniofacial anthropometry is an important branch of anthropometry used to describe phenotypic variations of humans. Cephalometry is one of the

important subfield in craniofacial anthropometry in which dimensions of head and face are measured. The cephalic index was introduced by the Swedish anatomist Retzius over a century ago to measure skull shape (Kelso 1974). The cephalic index is the percentage ratio of head breadth and head length (Williams et al. 1995). Cephalic index in human population varies from 70 % - 90 % (Harrison et al. 1990). The cephalic phenotypes of human population were described as dolicocephalic (71.0-75.9%), mesocephalic (76.0 - 80.9%), brachycephalic (81.0 - 85.9%) and hyperbrachycephalic (>86.0 %) according to the percentage value of cephalic indices (Rexhepi and Meka 2008). This is an important parameter that is useful in anthropological studies for assessing the variation between different genders as well as in ethnic groups. Comparative study on cephalic index between parents and their offsprings and siblings can give evidence to genetic transmission of inherited characters as well (Williamset al. 1995). Morphometry and morphology of head is also useful in pediatrics, forensic medicine, plastic surgery, diagnostic comprehension between patient and ordinary individuals.

Literature suggests that Sigiriya which is situated in the intermediate climatic zone in Matale district in Sri Lanka may have been occupied by *Homo sapiens* as far back as Mesolithic period of Sri Lanka (Adikari 1998). There is evidence to suggest that Sigiriya had been continuously occupied by *Homo sapiens* during the prehistoric, protohistoric and historic eras (Adikari 2008). Presently, the *Purana* population whose ancestry runs back to the times of the Sinhalese Kings of the 5th century A.D. (1,450 YBP) is mostly genetically and biologically isolated from the rest of the modern Sinhalese population living in the surroundings (Bandaranayake et al. (1990). Thus, Sigiriya is considered to be a site of anthropological importance where anthropological materials are available for investigations. Today, they face an imminent threat of extinction because of the isolation and inbreeding thus a detailed study of morphology, morphometry and genetics of the *Purana* population living at Sigiriya is a timely need. Thus, this study was designed to determine the cephalic phenotypes including morphology and morphometry in adult male and female *Purana* population at Sigiriya suburbs in Sri Lanka.

Materials and Methods

The *Purana* villages: *Talkote, Pidurangala, Diyakepilla* and *Nagalaweva* at Sigiriya suburbs were selected as study sites. With their consent 107 male and 206 female adult *Purana* inhabitants living in four *Purana* villages were included in this study and those who showed any craniofacial deformity or injury were excluded from the study. The age range of the subjects was from 20 - 37 years.

The selection of the individuals was based on the recorded *Purana* pedigree from the survey conducted at *Purana* villages in Sigiriya suburbs in 1981 (Bandaranayaka and Mogren 1994). The

survey launched in 1981 on population density, clans and castes of *Purana* villages of Sigiriya suburbs revealed that *Talkote, Pidurangala* and *Diyakepilla Purana* population had *Gamagedara, Aluthgedara, Undiyagedara, Beddegedara* as their surnames and *Nagalaweva* population was represented by their surnames such as *Millagahagedara, Kongahagedara* and *Aluthgedara* (Bandaranayaka and Mogren 1994). These surnames were identified as *Purana* surnames. The selected pedigrees such as *Gamagedara, Aluthgedara, Undiyagedara, Liyanagedara, Beddedar* are can be found in the *Purana* population at *Talkote, Pidurangala* and *Diyakepilla* and their traces can be traced back to at least three generations. Surnames such as *Millagahagedara, Kongahagedara* and *Aluthgedara* in *Nagalaweva* also can be traced back to three generations.

The ethical clearance to study cephalic indices and cephalic phenotypes was granted by the Ethics Review Committee of Faculty of Medical Sciences, University Sri Jayewardenepura, Sri Lanka (Ref No: 491/10).

Anthropometric Measurements

The selected persons were asked to remove any hair ornaments, jewellery, hair buns or braids. The maximum cranial length was taken from gabella, the bony prominence between the eyebrows and above the nasal depression, to the most posterior point of the occiput (inion) by spreading calliper as shown in Figure 1. The maximum length in between the two parietal eminences and right angle to the sagittal plane was measured as cranial breadth by spreading calliper (Fig. 2).

The cephalic index of each individual was calculated by using measured maximum cranial length and maximum cranial breadth of each individual adopting the following equation reported in Harrison et al. (1990).

$$\text{Horizontal cephalic index} = \frac{\text{Maximum cranial breadth} \times 100}{\text{Maximum cranial length}}$$

Maximum cranial length and maximum cranial breadth were measured after careful superficial palpation of anatomical landmarks and measurements were taken to the nearest 1 mm. All measurements were taken between 9:00 - 12:00 hours in the morning to eliminate discrepancies due to diurnal variation. All measurements were taken three times and the mean was taken for further analysis. All measurements were taken by the same individual to minimize the errors in data collection.

The measured and calculated quantitative cephalic parameters of male and female adult Purana populations residing in *Purana* villages:- *Piduranagala, Diyakepilla, Nagalaweva* and *Talkote* were statistically analyzed separately by applying Turkey's pair wise tests after one-way ANOVA (Minitab version 15) to determine the mean ±SD, range in parenthesis and the significant differences among gender. P value of < 0.05 was considered statistically significant.

The cephalic phenotype of each individual was categorized as Dolicocephalic (71.0 –75.9) Mesocephalic (76.0 - 80.9) Brachycephalic (81.0- 85.9) and Hyperbrachycephalic (>86.0) accordingly to percentage value of cephalic index (Williams et al. 1995).

Results and Analysis

The calculated mean horizontal cephalic index of male and female *Purana* population was (79.40 ± 4.95) and (81.00 ± 6.04) respectively. The mean cephalic index of female was higher than of male's significantly (P<0.05) (Table 1 and Table 2). Gender differences with respect to the mean cranial length, cranial breadth were found to be significantly higher in males compared to females (P<0.05). The common cephalic phenotype of the *Purana* population was mesocephalic 80.00 ± 3.95 represented by 35% in the population irrespective of gender. The mesocephalic cephalic phenotype was the most common cephalic phenotype seen in both male (41%) and female (34%) *Purana* populations in Sigiriya suburbs. (Table 3). The rare type of cephalic phenotype was Hyperbrachycephalic (15%).

Discussion

The variations of cephalic dimensions, indices and cephalic phenotypes of Homo sapiens in different parts of the world have been reported. (Thomas et al. 1980; Ricklan and Tobias 1986; Bhatia et al. 1994; Hwang et al. 1995; Manjunath 2002; Del Sol 2005; Golalipour 2006; Golalipour et al. 2007; Acer et al. 2007; Kumar and Gopichand 2013). The mean cephalic indices of the *Purana* male (79.43 ± 4.95) and female (81.04 ± 6.04) individuals in this study were higher than the mean value of present Sri Lankans (male as 78.04 and female as 79.32) (Illayperuma 2011). The mean cephalic index (80.00) of *Purana* population irrespective of gender which falls into mesocephalic head phenotype is higher than of the Indian population (76.06) that falls into mesocephalic head phenotypes (Bhasin 2006).

In the present study, the mean cephalic indices of the *Purana* males (79.43 ± 4.95) and females (81.04 ± 6.04) were close to of north Indian males (79.14), Igbo males (79.14) and north Indian females (80.74) respectively (Oladipo and Olotu 2006; Anitha et al. 2011).This finding was higher than of West African males (77.67), Haryanvi males in India (66.72), Andra males in India (76.28) (Odokumar et al. 2010; Gujaria and Salve 2012; Kumar and Gopichand 2013) and This finding was lower than Ijaw males (80.98), Ogonis males (111.18) and Gujarati males in India (80.42) (Oladipo and Olotu 2006; Oladipo and Olotu 2009; Gujaria and Salve 2012).

Mean cephalic index of females was 81.04 ± 6.04. This finding was higher than of Ijaw females (78.24), Igbo females (76.83), Ogonis females (75.09), Haryanvi females (72.25), Andra females (78.16) (Oladipo and Olotu, 2006; Oladipo and Olotu 2009; Gujaria and Salve 2012; Kumar and Gopichand 2013) and the finding was lower than of Gujarati females (81.20) (Gujaria and Salve 2012).

The dominant type of mesocephalic cephalic phenotype (medium wide-long head) of the *Purana* population (41% in males, 34% in females) was different from dolicocephalic cephalic phenotype (long head) of Sri Lankan males (35%) and brachycephalic phenotype of Sri Lankan females (46.15%) (Illayperuma 2011). The dominant phenotype of head in Purana males -mesocephalic (41%) was similar to Gujarati males in which 41% of male population mesocephalic and Mapuche males in Chile (Shah and Jadhav 2004; Del sol 2005) in which 66% of male population was mesocephalic. The second dominant cephalic phenotype in *Purana* males was brachycephalic (29%) which is predominant in Turkman males (42.4%) in North Iran and Tehran – Iran (36.6%) (Abolhasanzadeh and Farahani 2003; Gololipour et al. 2007). The third dominant cephalic phenotype in *Purana* males was Dolicocephalic (20%) which is predominant in Indian student males (33%) and Indian males (58.5%) (Bhatia et al. 1995; Yagain et al. 2012). The least common cephalic phenotype of Purana males was Hyperbrachycephalic (10%) which is predominant in Fars males in North Iran (52%) and South Iran (34. 3%) (Golalipour 2006; Vojdani et al. 2009).

In Purana females, mesocephalic (34%) cephalic phenotype was more common. It is similar to Indian females in Mahrasta (40%) (Nemade and Nemade 2014). The second dominant cephalic phenotype of *Purana* female was brachycephalic. Brachycephalic phenotype was dominant in females in Tehran -Iran (42.7 %), Southern Iran (42.5%) and Indian females (49%) (Abolhasanzadeh & Farahani 2003; Saha and and Jadhav 2004; Vojdani et al. 2009). The least common cephalic phenotypes of *Purana* female were hyperbrachycephalic (17%) and dolicocephalic (17%). The hyperbrachycephalic phenotype was dominant in Fars females in northern Iran (53.6%) (Golalipour 2006).

The most common cephalic phenotype identified through in this study Regardless of gender is mesocephalic (35%), which is similar to Mapuche individuals (66 %) and Gujaratees in India (41 %), Turkmans (42.4%) and Iranians (36.6%) (Abolhasanzadeh and Farahani, 2003; Shah and Jadhav 2004; Del sol 2005) and different from most of the other populations in the world such as Albanian Kosov populations (50.4 %) Albanians (79.5 %) and Greeks (48.97%) showed predominantly brachicephalic cephalic phenotype and Indians (58.5%) (Bhatia et al. 1955), Bulgarians (34 %) and Serbs (39.2 %) showed predominantly dolicocepahalics cephalic phenotype (Rexhepi and Meka 2008).

Comparing previous records of cephalic phenotypes of different races with present results indicates that Purana population living in Sigiriya suburbs in Sri Lanka is different from most other races in the world and present day Sri Lankans as well. Accordingly, it can be concluded that the Purana population living in Sigiriya suburbs is different from present Sri Lankans and most others in the world in terms of cephalic dimensions and cephalic phenotypes.

The variations in cephalic dimensions, indices and cephalic phenotypes between and within the population are attributed to a complex interaction between genetic and environment factors (Okupe et al. 1984; Kasai et al. 1993; Golalipour et al. 2003). The climatic conditions where they live play a major role in determining cephalic phenotypes (Bhasin et al. 1994). Climatic condition of monsoon activity with short dry season and cold winters along with short summer results in producing dolichocephalic head phenotypes as compared to other climatic regions. The variations of cephalic phenotypes have been identified among occupational groups, ethnic groups and language groups in India (Bhasin et al. 1994).

The proposition or the assumptions that the present-day *Purana* inhabitants at villagesin Sigiriya suburbs are descendants of the contemporary or near contemporary *Vedda* community in Sigiriya region or that they are in any way connected with the prehistoric hunter gatherers of the distant past is debatable (Bandaranayake et al. 1990). The *Purana* populations in Sigiriya do have *Purana* surnames such as *Aluthgedara, Gamagedara, Undiyagedara, Beddegedara, Millagahagedara, Kongahagedara* etc, and they their caste system exist by strictly practicing their marriages among themselves (Bandaranayak and Mogren 1994). They trace their ancestry to the times of the Sinhalese Kings of the 5th century A.D. (1,450 YBP) (Bandaranayake et al. 1990). Therefore, it can be hypothesized that this community continues to persist as an isolated population keeping genetic signature of ancient settlers. This may affect the cephalic phenotypic variations seen in *Purana* population.

Most of *Purana* population at Sigiriya suburbs presently speak Sinhala and are Buddhists just like modern day Sri Lankans. The subsistence economy of the *Purana* population was hunting and gathering of berries, tubers and edible wild plants. This is common to many traditional pre - modern Sri Lanka as *Vedda*. Themost distinctive specialization in this area in the past had been the extensive practice of honey-gathering which indicates reminiscence *Vedda* community way of life, especially the wet mountain *Vedda* (Bandaranayak and Mogren 1994). Today, they practice wet rice cultivation, *chena* cultivations, and livestock raring, hunting and fishing using traditional methods. The traditional occupational patterns in *Purana* population specific to them may affect the cephalic phenotypic variations seen in *Purana* population as discussed in the Bhasin et al. (1994).

Genetic factors, traditional occupational patterns may affect the cephalic phenotypic variations seen in *Purana* population more than other determiners of cephalic phenotypes such as ethnic groups, language groups, climatic factors, altitude etc.

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Tables

Table 1 - Head measurements and cephalic indices of the *Purana* male population (n=107)

	Mean	S. D	P value	Range Minimum	Maximum
Head length	18.2	0.95	0.000	13.5	18.9
Head breadth	14.4	0.99	0.000	10.40	18.50
Cephalic Index	79.4	4.95	0.019	69.44	82.35

Table 2 - Head measurements and cephalic indices of the *Purana* female population (n=206)

	Mean	S. D	P value	Range Minimum	Maximum
Head length	17.5	1.08	0.000	12.0	18.5
Head breadth	13.9	0.88	0.000	11.00	17.02
Cephalic Index	81.0	6.04	0.019	64.86	84.41

Table 3 - Frequency of cephalic phenotypes among Purana male and female population (n=213)

Head phenotype	Male	Female	Both male and female
Dolicocephalic (71.0 -75.9)	20%	17%	18%
Mesocephalic (76.0 - 80.9)	41%	34%	35%
Brachycephalic (81.0- 85.9)	29%	32%	32%
Hyperbrachycephalic (>86.0)	10%	17%	15%

Figures

Fig. 1. Spreading caliper position for maximum cranial length

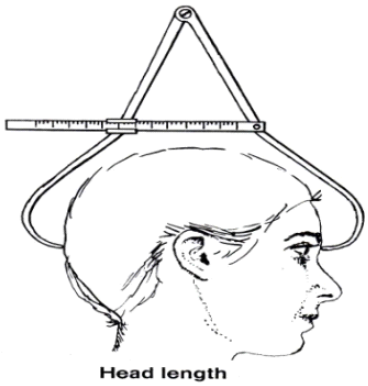
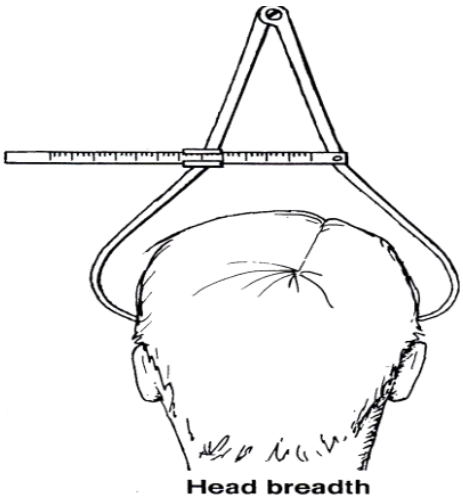


Fig. 1. Spreading caliper position for maximum cranial length



Study of Renal Artery Patterns in a Sri Lankan Population

Dissanayake PH[1], Jayasekera RW[2]

[1]*Department of Anatomy, Faculty of Medical Sciences, University of Sri Jayewardenepura.*

[2]*Department of Anatomy, Faculty of Medicine, University of Colombo.*

Abstract

Introduction

The increased frequency of surgical as well as diagnostic and interventional radiological procedures involving the kidneys and the renal vasculature has shown a definite demand for a

re-evaluation of the renal arterial anatomy and its variations.

Objective

The objective of this study was to assess the anatomy of the renal arterial pattern in a Sri Lankan population.

Methodology

382 human cadaver kidneys were analyzed for its arterial anatomy.

Results

Of the 382 kidneys analysed, single renal arteries were found in 260 specimens (68.06%) and 122 (31.94%) had multiple renal arteries. The incidence of multiple renal arteries in males were 30.68% and 34.75%. in females. A higher number of multiple renal arteries were found on the left, ie: 70 out of 122 (57.38%) compared to 52 out of 122 (42.62%) on the right.

A superior polar artery was given off from the main renal arteries in 86 kidneys (22.51%) and an inferior polar artery was noted arising from the main renal artery in 29 kidneys (7.59%).

Pre-hilar segmental branching was seen in 111(29.06%) of the main renal arteries.

Conclusion

31.9 % of our study population had multiple renal arteries. There was no significant difference with regard to the incidence of multiple renal arteries, between the two sexes nor on the sides. Prior knowledge of possible variations that may exist is important for the diagnostic and interventional radiologists, transplant surgeons and urologists. No detailed study has been done in a Sri Lankan population and in this regard our findings may provide some insight to the practising clinician in Sri Lanka.

Introduction

The incidence of diagnostic, therapeutic and surgical procedures involving the kidneys has increased in the recent past and the renal arterial anatomy and its variations do play a significant role in the above procedures. Hence there is a definite need to re-evaluate the normal renal arterial anatomy and its variations. (1,2) Normally expected anatomy is to have a single renal artery supplying the hilum, but since 1552 when Eustachius first recorded anomalous or aberrant arteries, multiple variations have been

documented with a broad spectrum of differences in the recorded literature in different study populations. (3,4,5) Comprehensive anatomic dissections and arteriographic studies have shown that the simple form of renal arterial pattern occurs in less than half of individuals. (5,6,7) The location and anatomy of the renal arteries is of importance for vascular surgeons, general surgeons, traumatologists, urologists and radiologists during surgical procedures and for diagnostic purposes, in order to arrive at a correct diagnosis and to perform surgery free of complication. Anomalous blood vessels are interesting to know from a scientific point of view, as especially they so often lead to the understanding of obscure problems of phylogeny and ontogeny. (8,9)

The development of kidneys begins in the pelvis and migrate to its final adult location in the lumbar region. In this process they either retain blood vessels from their original location or receive and incorporate new vessels along its pathway to the final location. The presence of a range of accessory renal arteries originating from the pelvic vessels to the abdominal aorta is to be expected due to the persistence of the remains of embryonic renal vessels normally lost, in the process of development. (10,11)

Methodology

Ethical clearance was obtained from the Ethics review committee of the Faculty of Medicine, Colombo. Human cadaver kidneys were collected from the postmortems conducted at the Judicial Medical office, Colombo. The sample size was 382 human cadaver kidneys which were collected within 24 hours of the time of death. Specimens with diseased renal vessels, significantly small kidneys suggestive of renal vascular disease and patients with evidence of previous surgery in the related region were excluded. The specimens were carefully dissected and the morphology of the Reno-vascular system was analyzed and documented. The special morphological characteristics were noted, with regard to the renal arteries. The number of branches given off from the renal artery, presence or absence of the superior polar branch, presence or absence of the inferior polar branch and the presence or absence of the prehilar segmental branching were documented. The data was statistically analyzed utilizing the SPSS for windows software package.

Results

382 cadaver kidneys were analyzed where the age ranged from 7 years to 94 yrs. 118 (30.9%) were from females and 264 (69.1 %) were from males. Of the 382 kidneys, single renal arteries were found in 260 specimens (68.06%) and 122 (31.94%) had multiple renal arteries.

The incidence of multiple renal arteries in males were 30.68% and 34.75%. in females. A higher number of multiple renal arteries were found in the kidneys from the left side, ie: 70 out of 122 (57.38%), compared to 52 out of 122 (42.62%) from the right.

When there were multiple renal arteries, 63 out of 122 (51.64%), of the additional renal arteries that entered the hilum, 38 (31.15%) entered the upper pole and 21 (17.21%) entered the lower pole.

A superior polar artery was given off from the main renal arteries in 86 kidneys (22.51%) and an inferior polar artery was noted arising from the main renal artery in 29 kidneys (7.59%).

Two specimens had two superior polar branches arising from the single main renal artery.

Four specimens had superior polar branches originating from the additional renal arteries.

Pre-hilar segmental branching was seen in 111(29.06%) of the main renal arteries. Only three

additional renal arteries (2.29%) had pre-hilar segmental branching.

Discussion

A search of the literature on the renal arterial anatomy and its variations in populations reveal a fair number of articles. Variations of the renal arterial pattern is becoming more relevant and important, with the increasing demand of diagnostic imaging, image guided therapeutic interventional procedures and surgical procedures such as renal transplantation. In addition vascular reconstructions involving renal arteries are becoming more commonplace in clinical and surgical practice. An awareness of the incidence of these variants in the general population in Sri Lanka will be of immensely beneficial in the surgical management of the aforementioned specialties.

In our study population we encountered 68.06 % of kidneys with a single artery. When sex distribution of the single renal artery was analyzed, 69.32 % of males and 65.25 % of females had single renal arteries (P = 0.609). Similarly 63.35 % of left kidneys had a single renal artery and 72.78 % on the right. (P = 0.247). There was no significant correlation with the sex nor with the side of the kidney. Even though a wide variation in the points of origin has been described in the literature, we encountered all additional renal arteries arising from the abdominal aorta and none from the pelvic arteries nor from the branches of the aorta.

There is no unanimity in the nomenclature of renal arteries. The terms "extra", "aberrant", "ectopic" and "accessory", are commonly used when there are multiple arteries. Whatever the term that is used, the renal artery is considered to be an end artery and a damage to any renal artery regardless of its caliber, point of origin or destination will lead to ischaemia of the related renal tissue supplied by that particular artery. (12,13)

In 1954 Graves (14) demonstrated that once the renal artery enters the hilum, distribution of the arteries within the kidney substance was constant, namely the apical, upper, middle, lower and posterior five segmental branches. But the main stem of the renal artery may divides at any point between the aorta and the hilum, ie; pre-hilar segmental branching. In our study pre-hilar segmental branching was seen in 29.06% of the main renal arteries. Prehilar segmental branching was lower in similar studies done by Munnusamy 2016 and Ozkun 2006, 13% and 8%

respectively. (15,16) In our study, from the renal arteries that showed pre-hilar segmental branching, 39.47 % were on the right side and 60.53 % were on the left side. There was a significant relationship between the side and the pre-hilar segmental branching in our study (P = 0.001) ie: occurrence more on the left but not in the previous 2 studies. (15,16)

Variations of renal arteries have been reported by several authors. Its prevalence range from 20% to 50% in their series. In our study, we encountered 31.94 % of the kidneys having multiple renal arteries. The incidence of multiple renal arteries in males was 30.68% and in females were 34.75%. (P = 0.509). A higher number of multiple renal arteries were found in left kidneys, (36.65 %) compared to (27.22 %) on the right side. (P = 0.586). There is no statistically significant difference of the multiple renal arteries depending on the sex nor the side. When the data is reviewed on the multiplicity of renal arteries, it seems that ethnicity and geographical location of the population could be an important factor on which the multiplicity of the renal arteries depend. (3,5,6,7,17,18)

When superior or inferior polar branches are present they are more prone to damage during mobilization of the kidneys or during other procedures. The inferior polar artery can compress the ureter causing obstruction. (19,20) In our study 22.51 % of the specimens had a superior polar branch given off from the main renal artery and 7.59 % had an inferior polar branch given off from the main renal artery. Comparison of the incidence of superior and inferior polar branches were done with a similar study by Rupert RR (19, 20). (Table 1, 2)

Further, in our study, two specimens had two superior polar branches arising from the main renal artery.

Radiologically guided interventional procedures dealing with the kidneys are an integral part of the interventional radiologists work. Knowing the deviations from the normal anatomy of renal arteries in a respective population will prevent inadvertent damage, unexpected bleeding and other complications. Also being aware of the vascular variations one can impose restrictions in the area of exposure at surgery. Presence or absence of variations of the renal arterial pattern will influence the management plan of the vascular and transplant surgeon or the angiologist. (1,2)

Atherosclerotic renal artery stenosis is known to be a cause of systemic arterial hypertension and renal insufficiency. Percutaneous renal angioplasty and stenting is an accepted treatment modality, which gives a favourable response in ostial stenosis and improves blood pressure control, and delays or stabilizes renal insufficiency. Awareness of the variations in the anatomy of the renal arterial system is important in the handling of technical problems of percutaneous treatment of renal artery stenosis. (21)

Selective arteriography is used to evaluate renal lesions. However, it is important to inject all arteries whenever multiple renal arteries are present. If one of the renal segments is not filled with contrast in a kidney with multiple

arteries, radiographically a single anatomic variant may lead to a wrong diagnosis of an infarct, avascular tumour or intrarenal haemorrhage. Its recognition may help to avoid a gross error in diagnosis. Angiographic evaluation of the kidney is incomplete without visualization of the entire renal vasculature and with the full renal parenchyma. (22,23) Renal angiography is helpful in selecting donors for renal transplant surgery, in the evaluation of the functions of the diseased kidney, differentiation between cortical tumours and cystic disease, renal anomalies, congenital hypoplasia, chronic pyelonephritis, essential haematuria, ureteral obstruction and hypertension of doubtful aetiology. Once renal angiography is performed to interpret its findings, it is essential for the interventional radiologist to have a sound knowledge of the renal vasculature and its variations. Arteriography may also be considered before radical nephrectomy involving previous ligation of the renal artery, because the presence of multiple renal arteries may lead to failure in the control of the arterial supply before tumorous kidney mobilization. (12)

Conclusion

The topographic anatomy of the renal vasculature is subject to considerable variation. 31.9 % of our study population had multiple renal arteries. There was no significant difference of having multiple renal arteries, between the two sexes nor on the sides. When the data is reviewed on the multiplicity of renal arteries, it seems that ethnicity and geographical location of the population could be an important factor which the multiplicity of the renal arteries depend on. Deviations from the normal anatomical pattern of arteries, and prior knowledge of possible variations that may exist, is important for the diagnostic and interventional radiologists, transplant surgeons and urologists who deal with kidneys. No detailed study has been done in a Sri Lankan population, and in this regard our findings may provide some insight to the practicing clinician in Sri Lanka. Also the variable morphology of renal arterial anatomy is of great interest to the anatomist and the embryologist.

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Tables

Table 1 - Incidence of the superior Polar Branch

Side	Rupert RR (n=118)	Present series (n=382)
Right	24.0%	14.4%
Left	14.0%	9.5%

Table 2 - Incidence of the inferior Polar Branch

Side	Rupert RR (n=118)	Present series (n=382)
Right	14.0%	6.5%
Left	4.0%	3.7%

CASE REPORTS

Massive Reactionary Haemorrhage Due to Superior Mesenteric Artery Blowout Following Laparoscopic Biopsy of Retroperitoneal Mass - A Case Report

Rathnaweera W.S.[1], Galketiya K.B.[2]
[1]*Teaching Hospital, Peradeniya.*
[2]*Department of Surgery, Faculty of Medicine, Peradeniya.*

Abstract

Thermal injury on vascular walls can result in delayed rupture of vessels. This can be a cause of life threatening reactionary haemorrhage. Increasing use of energy devices in laparoscopic surgeries can rarely result in such events which may have devastating consequences. Careful usage of these heat generating energy sources can prevent such incidences and prompt resuscitation and haemorrhage control are lifesaving. We present a case report of a severe haemorrhage from blow out of superior mesenteric artery following laparoscopic para-aortic lymph node biopsy.

Introduction

Intra-abdominal hemorrhage is a common cause of hypovolemic shock in the post-operative period following abdominal surgeries.[1,2] Delay in resuscitation and control of bleeding can be life threatening. Reactionary haemorrhage following laparoscopic abdominal surgeries can be due to several causes which were not seen in open surgical era such as opening up of bleeders which had been concealed by the tamponade effect of pneumoperitoneum, slipped clips and effects of thermal injury on vessel walls.[1,2] We report a case of life threatening reactionary intra abdominal bleeding after laparoscopic biopsy of an abdominal mass, possibly due to thermal effects on arterial wall.

Case History

A 40 year old male presented with intermittent left sided upper abdominal pain radiating to back for 3 months duration. Examination revealed a non tender vague mass in the left hypochondriac region. His ultrasound scan showed 3.4 cm x 4.1 cm sized Para-aortic mass related to the pancreas. Contrast enhanced computer tompgraphy CECT of the abdomen revealed a lymph node mass inferior to the pancreatic tail adjacent to left renal artery and superior mesenteric artery. No other masses or evidence of a primary lesion was seen and the possible diagnosis was a lymphoma.. Patient underwent laparoscopic lymph node biopsy in right lateral position, with a

camera port and 4 working ports. Splenic flexure and the descending colon were mobilized exposing the retroperitoneum. Left kidney, renal vein, renal artery, aorta, superior mesenteric artery and the tail of the pancreas were defined by dissection with ultrasonic dissector and bipolar diathermy forceps. The intended biopsy from the soft tissue mass was performed, haemostasis was confirmed. No drains were placed. By the evening of the same day, the patient was mobilized and started on oral feeding. Pain was managed with oral paracetamol and diclofenac sodium. The patient was planned to be discharged home after 48 hours. At 36 hours from initial surgery he suddenly got severe abdominal pain and distension with hypovolaemic shock. Immediate crystalloid infusion, blood transfusion and exploratory laparotomy were performed. A 3.5 l haemoperitoneum from a blowout of superior mesenteric artery about 1 cm from its origin was identified. Initial control was achieved with compression and later with vascular clamps. A 50% arterial wall blow out was noted and repaired with 6/0 polypropylene and complete control of haemorrhage was achieved.

Patient was managed in the intensive care unit ICU for 3 days with transfusion of blood and blood products, during his hospital stay he acquired a pneumonia which required intra venous antibiotics and ultrasound guided drainage of pleural effusion. He recovered completely and was started on normal diet on day 3 and discharged on 18th day from initial surgery. (Fig. 1)

Discussion

Laparoscopy is an excellent minimal access tool for biopsy of retroperitoneal tissue as it avoids the morbidity of otherwise required large abdominal incisions. However it has its own complications like in this case. Extensive use of energy devices which generate heat can result in rare complications such as lateral thermal damage to surrounding structures like what our patient had.

Dissections in the retroperitoneum and in the para-aortic region were carried out using ultrasonic and bipolar diathermy devices. The active blade can reach up to 80 degrees Celsius which can desiccate tissues even at a short range of distance. Adventitial desiccation of the SMA during the dissection might have weaken the arterial wall and resulted in blowout due to its relatively high pressure. Due to retroperitoneal dissection, the tamponade effect of retoperitoneum is lost which resulted in sudden bleed in to the peritoneal cavity. It is unlikely that pneumoperitoneum of 12 cm H_2O had masked otherwise overt arterial bleeding during the operation. Being aware of possible reactionary bleeding like this, prompt resuscitation and intervention are lifesaving.

Literature about these possible effects of ultrasonic and bipolar devices is scarce[3]. Further study about tissue effects of these new energy devices need to be taken in to attention, even though these types of incidences are rare.

Conclusions

Laparoscopy is an excellent minimal access tool for abdominal surgery however the increasing use of energy devices can have their own complications. The tissue effects of ultrasonic devices and diathermy devices need further attention and studies to understand and prevent post-operative catastrophes.

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Figures

Figure 1 - Operative photograph of the area of dissection
L RA = Left renal artery, SMA = superior mesenteric artery

Laparoscopic low anterior resection and transanal pull-through for low rectal cancer: A case report

HMKB Herath[1], RMIM Senevirathne[1], WUC Alwis[1], KB Galketiya[2]

[1]*Teaching Hospital Peradeniya, Sri Lanka*

[2]*Department of Surgery, Faculty of Medicine, University of Peradeniya, Sri Lanka*

Introduction

Surgical resection of lower rectal tumours is often considered to be technically challenging especially when the anal sphincter mechanism needed to be spared to avoid lifelong colostomy. Stapling has made anastomosis below peritoneal reflection easier. However with very low tumours stapling too may be difficult due to short rectal stump. An alternative is to perform a transanal pull through and a colo-anal anastomosis. Use of laparoscopic resection in these cases reduces the morbidity associated with open resections. We report a case of successful use of tansanal pull-through technique to avoid diverting stoma in resection of a lower rectal tumour.

Case History

59 year old female presented with altered bowel habits and fresh per rectal bleeding for two months duration. Upon digital rectal examination she had an irregular growth at 6 O'clock position of the lower rectum about 5 cm from the anal verge. Biopsy and histopathological examination of the lesion revealed a moderately differentiated adenocarcinoma. She underwent a CT scan of the chest, abdomen and pelvis which showed a lower rectal tumour extending to a length of about 8 cm proximally with no evidence of invasion into mesorectal fascia (Figure 1). There were enlarged mesorectal lympnodes and metastatic deposits in segment IV and VIII of the liver and in both lung fields (Stage T3N2M1). Her pretreatment carcinoembryonic antigen (CEA) level was 2.72 ng\ml (Normal<3 ng\ml).

Following neoadjuvant chemoradiotherapy she underwent laparoscopic low anterior resection and transanal pull-through procedure. Dissection around the mesorectum and mobilization of proximal colon up to splenic flexure was carried out laparocopically. Perineal stage of the surgery began with circumferential mucosectomy at the dentate line and dissection up to the level of abdominal dissection. Total mesorectal excision of the tumour was completed and transanal pull though of the rectum containing the tumour and sigmoid colon was carried out. After excising the tumour with more than 5 cm proximal margin, proximal colon was attached to the dentate line with interrupted non-absorbable sutures leaving a free stump of about 10 cm outside the anus (figure 2).

Initial postoperative period was unremarkable and daily inspection of the external colonic segment was done. By postoperative day 4, intravenous fluids

were omitted and she was on semisolid diet. On postoperative day 7 external colonic segment was trimmed off under anaesthesia. Subsequent recovery was uneventful and she had retained her faecal continence. Upon histopathological examination of the specimen, the distal resection margin was clear of tumour by 5 mm.

Discussion

Surgical resection is an essential component in the treatment of rectal cancers and the two main surgical procedures that are being used today are the anterior resection (AR) and abdominoperineal resection with permanent colostomy. AR carries the benefit of avoiding lifelong stoma without compromising the oncological outcome (1). The colo-rectal anastomosis in AR is often difficult when the tumour is located lower down in the rectum but the introduction of stapling devices has allowed to take off the difficulties of hand anastomosis. However with very low tumours stapling too may be difficult. In this situation transanal pull through and colo-anal anastomosis is an alternative. This technique was first described in 1932 by Babcock (2). It has the benefit of avoiding temporary de-functioning stoma which can result in minor and major complications in about 10% of the cases (3, 4).

The use of laparoscopy also has increased over the past decade for patients with colonic cancers and several trials have demonstrated the equivalent short- and long-term oncological outcomes for laparoscopic and open approaches (5,6) with the added advantage of low morbidity compared to open approach (7). When combined with laparoscopy, transanal pull through technique will result in minimal scarring since there is no stoma creation while the specimen is extracted through the anus.

The patient under discussion had disseminated disease and the treatment was primarily palliative with the aim of improving survival as well. In this situation even with a shorter tumour free resection margin avoiding a permanent stoma will be beneficial. As the tumour was too low for stapling we performed a transanal pull through and colo-anal anastomosis. With the use of laparoscopic dissection the operative morbidity became less as there were no major abdominal incisions. Its magnified clear vision allowed us to carry out the dissection right down through the pelvic diaphragm which is an essential step for an easy perineal dissection via anus.

Conclusion

In surgical treatment of tumours in lower rectum laparoscopic low anterior resection and transanal pull-through is a feasible procedure.

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Figures

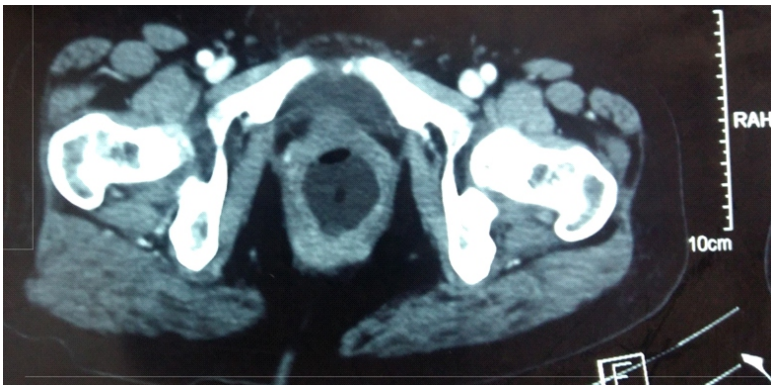

Figure 1: Contrast enhanced CT scan of the Pelvis showing eccentric wall thickening of the rectum

Figure 2: Distal colonic stump protruding out of the anus after surgery

A Case Report on Blunt Chest Trauma

Ganga NMPG[1], Galketiya KB[2]
[1]*Teaching Hospital Peradeniya, Sri Lanka.*
[2]*Department of Surgery, Faculty of Medicine, University of Peradeniya*

Abstract

Blunt chest trauma is a leading cause of death worldwide and may be missed in a poly-trauma patient. Multiple rib fractures, pneumothorax and lung contusions can cause ventilator insufficiency needing mechanical ventilation. Many patients can be managed non-operatively with timely use of intercostal drains, support of ventilation, pain relief and good physiotherapy.

We present a case of 48 years old male patient with multiple chest injuries following a fall who had a remarkable recovery.

Introduction

Blunt chest trauma is a leading cause of morbidity and mortality (1). Immediately life threatening thoracic injuries include, tension pneumothorax, pericardial tamponade, simple pneumothorax, massive haemothorax and flail chest. Rib fractures comprise a major part of blunt chest trauma and each additional rib fracture predisposes to more complications (2,3). Most injuries can be managed non-operatively with the timely use of intercostal drains, oxygenation, pain relief and good physiotherapy.

Case Report

A 48 years old male was brought to the casualty ward following a fall from 15 feet height on to a cement slab. On admission he was conscious and alert and complained of severe back pain and bilateral chest pain. He denied any history of loss of consciousness, ear nose oral bleeding, amnesia or vomiting. No abdominal pain. Airway was patent and bilateral breath sounds were heard equally with normal saturation on room air. There was marked tenderness over bilateral 8-10 ribs in anterior chest wall and respiratory rate was 20/min. There were right anterior chest wall abrasions. Initial findings of circulation were as follows. Pulse rate of 110/min, blood pressure 140/90mmHg and capillary refilling within 2 seconds. Abdomen was soft although mild tenderness over right hypochondriac region. Neurological examination of both lower limbs were normal.

Focused Assessment of Sonography for Trauma (FAST) was negative for free fluid. Chest, thoracolumbar spine and pelvis X-rays were taken. Pelvic X-ray was negative for acute injuries. On chest X -ray there were multiple rib fractures including 5^{th} and 6^{th} on right side and 6^{th} and 7^{th} on left side. No evidence were noted for pneumo/hemothorax. Seventh and eleventh thoracic vertebra compression fractures were also noted.

Vital signs measured in the ward and initial laboratory findings are as follows: Blood pressure: 140/90mmHg; Pulse rate: 110bpm; Respiratory rate: 21/min; Temperature: 98.7oF, pH = 7.31; lactate = 0.5mmol/l; pCO2 32mmHg; pO2 154mmHg; HCO3- 16.1mmol/l

Patient was resuscitated with oxygen via face mask, intramuscular opioid analgesics, and strict log rolling and kept under close observation.

Following day patient developed surgical emphysema on right thoracic region, worsening chest pain and difficulty in breathing. Examination revealed resonant percussion note and reduced breath sounds on right side with normal position of trachea. Repeat CXR was positive for right side pneumothorax. Intercostal tube was inserted under local anesthesia and admitted to Intensive Care Unit. Due to poor arterial oxygenation patient was intubated in the ICU.

During further imaging, CT scan of the brain, whole spine, abdomen and thorax were requested. They confirmed the bilateral rib fractures with bilateral basal consolidations, small right side plural effusion, right lung lower lobe contusion, and small right side pneumothorax.

Additionally there was T7 burst fracture and stable T 11 compression fracture and multiple fractured transverse processes of T8/T9. Other regions were normal. Unstable fractures were fixed in order to maintain good ventilation and facilitate early mobilization. He gradually recovered after 4 days in ICU and his rest of the hospital stay was uncomplicated. Patient was discharged on lumbar brace and oral analgesics.

Discussion

Safe triangle is an important land mark in inserting an intercostal tube. Its apex is formed by the axilla and lateral border of Pectoralis major and lateral border of Latissimus dorsi forms the anterior and posterior boundaries respectively. Inferiorly it is guarded by the 5th rib. Sticking to triangle of safety will prevent damage to abdominal organs, intercostal neurovascular bundle and breast tissue in females.

Chest X-ray (CXR) is an important tool in screening and diagnosing thoracic injuries. It is used as a primary initial diagnostic test (11). The sensitivity of CXR is 55.3% and 33% in identifying rib fractures and pneumothorax respectively (11). Pneumothorax on chest radiograph may be difficult to see on a supine image. Mediastinum may appear widened when the patient is supine.

Chest CT is more sensitive than chest x-ray for detection of fractured rib, scapula, sternum, and vertebra. With regard to pneumothorax and pneumomediastinum, CT is extremely accurate in detecting of abnormal accumulation of air density (10).

Rib fractures may compromise ventilation by many mechanisms. Pain from rib fractures can cause respiratory splinting which resulting in basal atelectasis and lower respiratory tract infection (2,3). Multiple consecutive rib fractures (flail chest) create an independent segment, moving paradoxically from the chest wall, potentially causing ventilator insufficiency (8). Patients with associated thoracic spinal fractures will have more respiratory insufficiency due

to more pain. Fragments of fractured ribs can penetrate pleura causing haemothorax or pneumothorax. Patients with multiple rib fractures and surgical emphysema should be closely observed because of possible delayed presentation of pneumothorax (7).

Pain in blunt chest trauma can be severe enough to compromise ventilator function, which can lead to serious complications (4,5,13). Patients should have good pain relief and may be given an incentive spirometer to facilitate respiratory movements. (12). There are several modes of analgesia including non-steroid anti-inflammatory medications, epidural catheters, intravenous opioids, patient controlled analgesia (PCA), intercostal blocks and paravertebral blocks (13) that should be individualized and used.

The majority of traumatic chest injuries can be managed with careful observation or minor surgery such as intercostal tube insertion (6). Only 12% to 15% of them will require thoracotomy (6). In patients with poor arterial oxygenation need mechanical ventilation via endotracheal tube (6). Ventilation in traumatic chest patients need proper balance between adequate ventilation and minimizing barotrauma (6). The goal of ventilation in this condition is low FiO2, plateau pressure, and using reduced tidal volumes to protect the lungs from harmful effects of ventilation. (6).

The patient presented had multiple rib fractures with pneumothorax. Intercostal tube failed to improve his oxygenation, so mechanical ventilator support was given. Fixing of unstable spinal fractures allowed early mobilization of the patient.

Conclusion

This case concludes the importance of timely insertion of intercostal tube and support of ventilation in chest trauma.

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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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Original and review articles must contain an abstract of approximately 250 words with four specified subtitles:

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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 aspects of their research and ensure that the work has been approved by an appropriate Ethical Committee. Where applicable, a copy of the ethical clearance certificate should be attached. In human experimentation informed consent from individuals should be obtained and this should preferable be stated.

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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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The tables should be numbered in the order of appearance in Arabic numerals. Each table should have a brief explanatory title. Each table should be typed on a separate sheet, with due regard to the proportion of the printed column/page.

Figures -

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.

References -

References are listed double-spaced in a separate reference section immediately following the text. References are numbered consecutively in the order in which they appear in the text; do not alphabetize. Identify references in texts, tables and legends by Arabic numerals (within parenthesis).

Congress abstracts should not be used as references nor may “unpublished observations” and “personal communications” be placed in the reference list. References cited as “in press” must have been accepted for publication and not merely in preparation or submitted for publication.

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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An audit on medical students' exposures to bio-hazards during cadaveric dissections

Mathangasinghe Y[1], Maddumaarachchi HSTM[1], Samaranayake UMJE[1], Perera MHS[1], Anthony DJ[1], Malalasekera AP[1]

[1]*Department of Anatomy, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka*

Introduction

Medical students are exposed to a wide range of potentially hazardous materials during cadaveric dissections. Therefore, we intended to study the prevalence of occupational exposure to biohazards and the safety measures taken by students.

Methods

An audit was conducted among two batches of medical students of the Faculty of Medicine, University of Colombo, soon after completion of the Anatomy curriculum. The study conformed to the guidelines of the declaration of Helsinki. Exposures, practices, prevention methods, health conditions of the students, their suggestions to improve safety measures and self-reported frequency of engaging in dissections in each session (as measured in a ten-point Likert scale) were assessed using a validated self-administered questionnaire.

Results

Of 196 respondents,50%(n=98) were males. Mean age was 21.8±1.1 years. During their first-year dissections,15.8%(n=31) had cut injuries,86.7%(n=170) had skin contact with cadaver fluids while 5.6%(n=11) had eye splashes. Of those with skin contact, 43.5%(n=74) washed immediately. Of those who had eye splashes, only 18.2%(n=2) washed immediately for 20 minutes as recommended by the WHO. Nine students reported new nail infections, 7 developed allergies to cadaver fluids and 15 developed skin rashes during the period of dissections. Mean score of the self-reported frequency of engaging in dissection was 7/10(SD=3/10). Pearson's correlations showed that the self-reported frequency of engaging in dissections positively correlated with the frequency of skin contact with cadaveric fluids(r=.161,p=0.035), but not with the frequency of cut injuries(p>.05) or eye splashes(p>.05). Students suggested the following safety measures: 63.3%(n=72)-lab coats, 55.6%(n=109)-masks, 16.8%(n=33)-goggles, 43.9%(n=86)-a lecture on lab safety, 44.4%(n=87)-a workshop and 40.3%(n=79)-a formal safety protocol.

Discussion and Conclusions

Given the numerous exposures to biohazards in the Anatomy laboratory we found that there is a gap between the current practice and the internationally recommended safety measures. Therefore, findings of this study should be taken into consideration in developing policies and improving awareness among students.

Learning styles among first year medical students: Are we addressing the diversity?

Mathangasinghe Y[1], Dissanayake MM[1]
[1]*Department of Anatomy, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka*

Introduction

Teaching Anatomy for the first-year medical students is challenging. Each individual has their own preferred methods in learning. Therefore, we intended to study learning styles among first year medical students.

Methods

A descriptive cross-sectional study was conducted among first year medical students of the Faculty of Medicine, University of Colombo. The study conformed to the guidelines of the declaration of Helsinki and was approved by the Ethics Review Committee, Faculty of Medicine.

Learning styles of the students were assessed using Visual Auditory Read/write and Kinesthetic (VARK) questionnaire, which is a validated questionnaire to assess the predominant learning preferences based on four sensory modalities.

Results

Of 100 respondents, 36% (n=36) were males and 64% (n=64) were females. Mean age was 21.8±1.1 years. Majority (94%, n=94) were Sri Lankans while six students (6%) were Bhutanese. None of them used English as their first language. Majority were multimodal learners (65%, n=65) followed by aural (15%, n=15), kinesthetic (11%, n=11), read/write (5%, n=5) and visual (4%, n=4). Sub group analysis of learning styles based on the affinity of the particular style (e.g. mild aural, moderate aural and severe aural) was not performed due to small number of the population. A Pearson's Chi square test of independence was calculated to compare the frequency of learning styles in males and females. There was no significant interaction between the genders ($\chi 2(4)=1.29$, $p=.86$).

Discussion and Conclusions

Learning styles among first year medical students were diverse. Unimodal learners were rare. Therefore, a multimodal teaching approach to stimulate multiple senses should be employed in teaching activities in Anatomy for the first-year students.

Renal length in a healthy Sri Lankan adult population - Sonographic study

Kodikara I[1], Gamage DTK[2], Nilmini KWGP[1], Nanayakkara BG[1], Ilayperuma I[1]
[1]*Department of Anatomy, Faculty of Medicine, University of Ruhuna, Galle.*
[2]*Base Hospital Tissamaharama, Tissamaharama.*

Introduction

Kidney to body height ratio (KBR) is considered as a better parameter compared to absolute renal length (RL) in renal size evaluation. Ethnic variations are described for renalsizes. Studies pertaining to renal length are scares for Sri Lankan population. Current study was conducted to evaluate RL and KBR for a group of Sri Lankan adults.

Methodology

Healthy adults presented for medical check-ups were recruited by random sampling method. Subjects with previous renal surgeries, renal disease or other chronic illnesses were excluded. Personal height was measured with a stediometer. Renal length was measured sonographically by a single Radiologist with 3.5MHz probe. One-way ANOVA was conducted to compare the effect of gender on KBR and RL.

Results

The study population (n=215) consisted of adult females (n=110) and males (n=115). Mean age was 24 years (19 -36 years). Mean height was; male (166.79±6.3 cm), female (156.49±6.3 cm). Mean RL-right kidney was 9.77± 0.78cm and RL-left kidney was 10.16±0.83 cm. Mean KBR of the right kidney was 0.60±0.05 mm/cm and left kidney was 0.63±0.05 mm/cm. The left RL and KBR were higher than those of the right side irrespective of gender ($p<0.001$). Gender effect was more significant for KBR bilaterally ($F-20.3=1.213$; $p<0.001$) compared to RL.

Discussion and Conclusions

Absolute renal length shows a better representation of renal size for the study sample with minimum gender effect. This preliminary study is the first step in establishing reference ranges for RL and KBR for a Sri Lankan population. Such data will be of value in diagnosing renal pathologies.

Pigmented border of the toe as a consistent landmark to the digital nerve

Maddumaarachchi HSTM[1], Mathangasinghe Y[1], Samaranayake UMJE[1], Malalasekera Ap[1], Anthony DJ[1]

[1]*Department of Anatomy, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka*

Introduction

The purpose of this study was to identify surface landmarks of digital nerves corresponding to the pigmented border of the toes.

Methods

A total of 140 digital nerves in 10 preserved adult cadaveric toes were studied. Photographs of the cross sections of the frozen toes at the proximal crease we analyzed using Image J (version 1.48) software. Circumferential distance to each digital nerve from the pigmented border, the direct distance to the nerve from the pigment border, the depth from the skin and the angle to the nerve from a perpendicular line at the pigmented border were measured.

Results

Majority (95.7%, n=134) of the digital nerves were located towards the plantar aspect of the pigmented border. The median circumferential distance to the digital nerve from the pigmented border was 0.28 (IQR=0.14-0.42) mm. The digital nerve was located 0.29 (IQR=0.20-0.37) mm deep to the skin in all the toes except in the big toe. In the big toe, this distance was 0.35 (IQR=0.29-0.42) mm. The median angle was 33.130 (IQR=14.670-50.500). Kruskal-Wallis test did not show statistically significant difference in the circumferential distances [$\chi 2(4)=7.348$, $p=0.119$] between toes, but there were significant differences in the direct distance from the pigment border [$\chi 2(4)=10.240$, $p=0.037$] and the depth from the skin surface [$\chi 2(4)=11.897$, $p=0.018$] among the toes. The post-hoc Mann-Whitney tests showed that these dimensions mainly differed in the big toe compared to the rest of the toes. Independent-samples Mann-Whitney U and Kruskal-Wallis tests showed that none of these measurements significantly differed according to the gender or the side of the toe respectively ($p>.05$). Spearman's correlation coefficient found a statistically significant negative correlation between the mid-thigh circumference and the circumferential distance from the pigmented border to the nerve ($r=.225$, $p=.008$).

Discussion and Conclusions

The pigmented border of toe is a reliable anatomical landmark to locate digital nerves.

Association of renal cortical echogenicity and renal function in chronic kidney disease - sonographic study

Kodikara I[1], Gamage DTK[2], Nilmini KWGP[1], Nanayakkara BG[1], Ilayperuma I[1]
[1]*Department of Anatomy, Faculty of Medicine, University of Ruhuna, Galle.*
[2]*Base Hospital Tissamaharama, Tissamaharama.*

Introduction

Ultrasonographically measured renal cortical echogenicity (RCE)is known to increase in chronic kidney disease (CKD) andof value in predicting the degree of renal function impairment. Renal function is routinely assessed by serum creatinine levels (Scr) and estimated glomerular filtration rate (eGFR). The aim of the study was to evaluate the association of RCE with Scr and eGFR in CKD subjects.

Methodology

Diagnosed CKD patients (n=100) were recruited after excluding the subjects with history of renal surgeries, acute renal failure or known liver disease. SCr values done within the last three months were recorded. eGFR was calculated using a standard formula. RCE was evaluated by a single Radiologist with linear probe. RCE was graded as grade 1,2 and 3 in comparison to the liver echogenicity (for right kidney) and splenic echogenicity (for the left kidney) according to the previous studies.

Results

The study population; 70% males and 30% females, aged 50 -89 years (mean 68±8.4 years). Mean SCr was 1.88±0.60 mg/dL and eGFR was 43.3±11.85 ml/min/1.73m^2. RCE grade 1 (23%), grade 2 (55%) and grade 3 (22%) were identified in the study population. RCE demonstrated a significant negative correlation with eGFR (r- 0.46, $p<0.01$) and significant positive correlation with Scr (r- 0.46, $p<0.01$). However, RCE was not affected by the age of the subjects (r- 0.09, $p=0.18$).

Discussion and Conclusions

According to the study results RCE appears to be of value in predicting renal function in CKD. Further studies with larger sample sizes are recommended to strengthen the findings.

Prevalence of Renal Cysts in a Group of Adult Sri Lankan Cadavers

Kodikara I[1], Nilmini KWGP[1], Hasan R[2], Nanayakkara BG[1], Ilayperuma I[1]
[1]*Department of Anatomy, Faculty of Medicine, University of Ruhuna, Sri Lanka.*
[2]*Department of Anatomy, Faculty of Medicine, University of Kelaniya, Sri Lanka.*

Introduction

Cysts are the most common space-occupying lesion of the kidney. With the advances in imaging technology and population-based studies on the prevalence of renal cysts, their clinical importance has grown. It is known that the prevalence of renal cysts correlates with advancing age.

Methods

Present study was conducted using a total of 52 kidneys (14 male and 12 female) obtained from formalin fixed cadavers from the Universities of Ruhuna and Kelaniya, Sri Lanka. Subjects with any history of renal and vascular impairments were excluded from the study. Morphological features including presence of single or multiple cysts, their numbers and the side of the kidney were recorded.

Results

The mean age of the study population was 65 years. The incidence of renal cysts was 65.38%.Cysts were more common in females (58.82%) as compared to the males (41.18%). The majority of cysts were solitary (70.59%) whereas 29.41% was multiple. Most of the renal cysts were present unilaterally (88.24%) and 11.76% was bilateral. The cysts were common in the right kidney (64.71%) compared to the left kidney (35.29%).

Discussion and Conclusions

This study provides an insight regarding the incidence of renal cysts in a group of adult Sri Lankan population. The prevalence rates of renal cysts should be calculated according to different age groups since any cohort comprising a greater proportion of elderly would render higher rates. Similar studies on a younger Sri Lankan cohort are recommended.

Relation of Palmaris Longus agenesis with laterality of hand.

Nazeefa HMFJ[1], Thayabaran M[1], Rajavarman R[1]

[1]*Department of Human Biology, Faculty of Health-Care Sciences, Eastern University, Sri Lanka*

Introduction

Palmaris longus is a small vestigial muscle present in the flexor compartment of forearm and shows greater variability. Palmaris longus tendon graft has a growing interest in constructive surgeries. However, Palmaris longus agenesis is seen among different ethnic groups in different countries and the prevalence of absence varies from 4% to 63.9%. It shows variation with laterality of the hand as well.

Methods

This study included 515 subjects of both sexes belonging to 18-26 years. Initially they were asked to perform the standard test (Schaffer's Test) to assess the presence of Palmaris longus tendon. Subsequently, other four test (Thompson's test, Mishra's test I, Mishra's test II, Pushpakumar's test) were done to confirm the absence of the tendon of Palmaris longus muscle.

Results

The collected data were analyzed by chi-square test using SPSS software. Agenesis of Palmaris longus was exhibited by 13.4% of the subjects. Among them bilateral agenesis was higher (8.5%) than unilateral whereas left hand agenesis was reported more (4.9%) than right hand (3.5%). Right and left hand agenesis were showed to have a statistically significant ($p=0.000$) and greater association ($V = 0.625$).

Discussion and Conclusions

Palmaris longus agenesis occurs as unilateral or bilateral. Our findings suggest that bilateral agenesis of Palmaris longus is more common and it shows higher association between right and left side agenesis. Furthermore, unilateral absence occurs more frequently on the left side than right.

Expression of Vascular Endothelial Growth Factor (VEGF) Gene in Oral Squamous Cell Carcinoma

Edirisinghe EAST[1], Weerasekera MM[2], Yasawardene SG[1]

[1]*Department of Anatomy, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka*

[2]*Department of Microbiology, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka*

Introduction

Oral squamous cell carcinoma (OSCC) is the second most common cancer in Sri Lanka. Tumor growth and metastasis depend on angiogenesis and lymph angiogenesis triggered by chemical signals from tumor cells in a phase of rapid growth. Different factors are known to induce the angiogenesis process. The most important angiogenic factor is Vascular endothelial growth factor (VEGF).

Methods

Forty histologically confirmed primary OSCC patients and 40 age sex matched controls were included in the study. VEGF gene expression in venous blood was determined using quantitative real time PCR using the TaqMan chemistry. The experiments were done in duplicate keeping the GAPDH gene as the housekeeping gene. Gene expression was determined using the $2^{-\Delta\Delta CQ}$ and fold increment was calculated.

Results

The mean fold increment of VEGF gene expression among patients were found to be high and showed 2.31 fold increase compared to the control group ($P<0.001$). Forty patients comprised of carcinoma of tongue (28/40), buccalmucosa (9/40), other oral mucosal sites (3/40). Majority [46.42%(13/28)] OSCC of tongue had fold increment ranging from 2.0-3.0 while 55.55% (5/9) patient with OSCC in buccal mucosa had the fold increment between 1-1.5. Histologically poorly differentiated cancers (4/40) had the fold increment value > 2.

Moderately differentiated OSCC (8/40) had 2 equal distribution peaks of 1.-1.5 (5/8) and 2.-2.5 (3/8). Majority of the patients 77.5%(31/40) were in T1-T2 TNM stage. Among them 23.10%(9/31) had fold increment of 1.0-1.5, while 33.3%(3/9) of T3-T4 stage had fold increment of 2.5-3.0.

Discussion and Conclusions

VEGF was significantly upregulated in OSCC patients. Also, these findings suggested a positive correlation between VEGF mRNA expression, TNM stage and histological differentiation.

Pneumatization of Anterior and Posterior clinoid processes - A preliminary study.

Dissanayake S[1], Dissanayake MHP[1], Dissanayake PH[1], Yasawardene SG[1]
[1]*Department of Anatomy, Faculty of Medical Sciences, University of Sri Jayewardenepura.*

Introduction

During anterior and/or posterior clinoidectomies the knowledge on presence of pneumatization is useful for the neurosurgeon in order to prevent a cerebrospinal fistulae formation as a complication.

Methodology

A collection of fifty computed termography (CT) images of the skulls which were available at the Department of Anatomy, Faculty of Medical Sciences, University of Sri Jayewardenepura were evaluated by two individuals independently and confirmed by a Consultant Radiologist.

Results

In the analyzed CT images 34 were males and 16 were females with a male to female ratio of 2:1

Ages of the study subjects span from 1 month to 90 years with a mean age of 53.2±2.32. Pneumatization of anterior or posterior clinoid processes was observed above 20 years of age. We did not observe an increased tendency for pneumatization of the clinoid processes with increased age.

In 24%(12/50) of the analyzed CT images showed pneumatization of the ACP and in 20%(10/50) showed pneumatization of the PCP.

Out of the pneumatized ACP, 25%(3/12) were only on the left side, 33.3%(4/12) were only on the right side and 41.7%(5/12) were on bilateral anterior clinoid processes.

Out of the pneumatized PCP, 40%(4/10) had pneumatization only on the left PCP. Pneumatization only on the right PCP or both PCP were shown in 30%(3/10) each.

In analyzed male CT images 17%(6/34) of ACP and 17%(6/34) of PCP were pneumatized. Where as in analyzed female CT images 37.5%(6/16) and 25%(4/16) of ACP and PCP were pneumatized respectively.

Discussion and Conclusions

Pneumatization of clinoid processes did not show a relationship with increased age. Presence of pneumatization were commoner in females compared to males. To compare the prevalence in pneumatzsation of ACP and PCP among different populations need further radiological studies to derive population values for Sri Lanka.