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CONTENT

EDITORIAL

Impact of the national economic crisis on research in Sri Lanka

Introduction

Sri Lanka's economic crisis has resulted in great hardship for the people and the greatest challenge to the government. The country is at present, experiencing an economic crisis, with high inflation and a severe scarcity of funding. The current financial crisis has led to sharp cuts in funding for scientific research by governments and charitable organizations, hiring freezes across university departments and academic institutes, and downsizing and restructuring the research and development of sciences. It is yet to see a sign of some light at the end of the tunnel whilst, the Sri Lankan economy remains fragile, and the future of science funding remains at a risk.

Global trends of expenditure on research and development

First, it is interesting to see the overall global picture of expenditure trends on research and development over the past years verse that of the current years of economic crisis. According to the global financial data on research and development expenditure, in 2002, the European Union set a target of 3% of its gross domestic product (GDP) for research and development by 2010. Even without an economic turmoil, the progression was marginal. For example, in 2008, the expenditure in the European Union was only 1.92% of the GDP, significantly lower than in the USA (2.79%) and Japan (3.45%). Having failed to reach the 3% gross domestic product spending target for research and development in 2010, the European Union reset the same objective for 2020. Unfortunately, due to the existing economic recession, the possibility of achieving the reseted target in 2020 seems to be further threatened. Despite increased investments, in recent years, the science spending almost frozen in Europe with the current global economic crisis. In 2021 and 2022, Circumstances have been progressively worsening in Europe, where several countries are in dire financial status and have proposed almost 25% reduction in research and development expenditure.

Furthermore, the financial downfall has also had a detrimental impact on non-governmental funding. For instance, cancer Research UK, one of the largest charities in the UK, recently had a 10% drop in research funding over the next three years. More recently, the funds on treatment and prevention AIDS, Tuberculosis, and Malaria have been reduced. Therefore, the global forecast is not promising at present.

Sri Lankan trend in expenditure on research and development

Sri Lanka faces an unsustainable debt and a severe balance of payments crisis, negatively impacting growth and poverty. According to the latest South Asia Economic Focus and the Sri Lanka Development Update, Sri Lanka's

real GDP is expected to fall by 9.2 per cent in 2022 and a further 4.2 per cent in 2023.

Domestic expenditures on research and development are expressed as a per cent of GDP. They include capital and current spending in the four main sectors, Business enterprise, Government, Higher education and Private non-profit. R&D covers basic research, applied research, and experimental development. A country's research capacity could be measured on the allocation of funds of gross domestic product spent on research, the number of researchers, publications in refereed journals and patents.

It is estimated that Sri Lanka allocated 0.11 per cent of its Gross Domestic Product (GDP) for research in 2013, whereas the world average is 2.23 percent. Sri Lankan research and development expenditure data is updated yearly, averaging 0.144 % from Dec 1996 to 2013. The data inclined the highest of 0.184 % in 1996 and the lowest of 0.11 % in 2013. According to the World Bank collection of development indicators, research and development expenditure in Sri Lanka was reported at 0.12836 % in 2018. In light of the above trends, even in the absence of severe economic crisis the national science funding was at a risk

Furthermore, the local situation is exceptionally fragile by looking into the overall global in the context of global economic crisis. The current situation in Sri Lanka is contending with strict measures. With the global recession persisting, the government faces a horrendous choices of monetary allocation for research and development. The real impact from 2021 and onwards yet to see with the upcoming data and for surely it will not be promising.

Consequences of struggle in expenditure in research and development in Sri Lanka

Potential repercussions of cut-down research expenditure can have detrimental long-term consequences. For example, reduced job opportunities due to hiring freezes and downsizing in academia and this could result in scientists emigrating, with the danger of a 'brain-drain'. Decreased research resources could limit scientific vision and opportunities for collaborative research which is a crucial fact of modern multidisciplinary research. The dearth of funding also drags and redirects the priorities towards more readily applicable projects to achieve more immediate returns over the long term projects. Policies favouring practical applicability over fundamental discovery threaten to reduce funding available for basic research, and it is essential to seriously look in to this matter since the outcome of basic science can never be fully predicted but it may have unexpected, lasting effects in the future.

Suggestions for the future

In times of economic crisis, it is essential to remember that research is a marathon, not a sprint. Investing in research is investing in the future. The expenditure on R & D needs to be sustained in order to have a long-term commitment to accumulating knowledge,

testing basic principles, and extrapolating the findings into applications that impact on day toady life. Safeguarding the future of scientific R & D will require wise decisions and long-term vision by policymakers.

Sri Lanka is well known for its high literacy rate, and it may be an added assert in going for a much richer research culture in the future. Globally recognized achievements of Sri Lankan research can be heard from many parts of the world. Those are related to diverse fields. Sri Lanka inherits a research culture that triggers from the undergraduate level and continues with their subsequent higher academic levels. Despite all the hardships we face currently, as a country, it is our task to make serious efforts to take this research in strength to strength and the discoveries to the world. I strongly feel that, the substantial and prominent role of today's researchers will inspire future generations of researchers of the country.

By

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ORIGINAL RESEARCH

Do sperm motility, morphology or associated factors predict the success rate of intrauterine insemination?

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Abstract

Objective: Infertility is a global health issue among couples of reproductive age. Intrauterine insemination (IUI) is a fertility treatment method where the processed sperms are deposited in the female uterus during the time of ovulation. The aim of this study was to explore the factors predicting the success rate of IUI (IUI-SR).

Materials and Methods: A descriptive retrospective study was conducted analysing SFA and corresponding IUI reports of couples who underwent IUI from January 2017 to August 2021 at the Professorial unit of Colombo South Teaching Hospital, Sri Lanka. The data were analysed using SPSS version 22.0.

Results: A total of 140 SFA and corresponding IUI reports were used. The IUI-SR was 18.57% (n=26). A significantly high IUI-SR was noted when the female partner aged <30 years compared to >30 years (p=0.000, OR=1.87), with first two IUI attempts compared to multiple IUI attempts (p=0.017, OR=0.271), pre-processed sperm concentration >30M/ml compared to <30M/ml (p=0.019, OR=3.12), and pre-processed sperm motility (progressive and non-progressive) >40% compared to <40% {p=0.039, OR=5.31). The period of abstinence (p-value=0.222), pre-processed sperm parameters such as total count (p-value=0.093), normal form morphology (p-value=0.082), viability (p-value=0.093), or post-processed sperm parameters such as concentration, progressive motility did not significantly influence the IUI-SR.

Conclusion: A significantly high success rate of IUI can be achieved when the female partner is aged <30 years and with the first two IUI attempts. Pre-processed sperm concentration >30M/ml, and pre-processed sperm motility of progressive >32% and non-progressive <15% also predict a higher success rate of IUI.

Keywords: Intrauterine insemination, sperm concentration, motility, morphology

Introduction

At present, infertility has become a major health issue among couples who try to conceive. World Health Organization defines infertility as a disorder of the male or female reproductive system or both reproductive systems, which fails to accomplish clinical pregnancy within one year or more with

unprotected regular sexual intercourse1. Globally, 8% to 15% of couples have fertility-related health problems (1). It is estimated that 35% of female factors, 30% of male factors, and 20% of both female and male factors lead to infertility. On the other hand, approximately 15% have unexplainable infertility (2).

In males, fertility can be affected by several factors such as genetic factors, hormonal imbalance, congenital anomalies, environmental and occupational factors, and psychological status leading to changes in sperm parameters resulting male infertility. Spermatozoa are produced through the process of spermatogenesis in the seminiferous tubules of the testis. Seminal fluid is a pale white, viscid, and opalescent secretion produced by male reproductive organs during sexual intercourse. Semen is composed of spermatozoa and seminal fluid. Seminal fluid analysis (SFA) is an investigation used to detect the fertility level of a semen sample. Microscopic sperm parameters such as sperm concentration, motility, morphology, vitality, and agglutination as well as macroscopic sperm parameters of semen appearance, volume, viscosity, and liquefaction time can be obtained through SFA (3).

Semen quality reduction may visualize as a reduction of sperm count (Oligozoospermia), reduction of sperm motility (asthenozoospermia), a combination of both reduced sperm count and sperm motility (Oligoasthenozoospermia), absence of sperms (azoospermia), or a high percentage of sperms with abnormal morphology (teratozoospermia). Additionally, reduced semen liquefaction time or reduction of semen volume or reduction of sperm vitality can contribute to low semen quality. (4)

Several assisted reproductive techniques (ARTs) are in use to treat various types of infertility conditions. Intrauterine insemination is one of the first-line fertility treatment techniques where processed healthy sperms are directly placed in the uterus at the time of ovulation to facilitate the fertilization process. Currently, this less invasive and less expensive fertility treatment method is more popular with increasing infertility cases among couples (5). Infertility related to less sperm counts, reduced sperm motility, unexplainable infertility, hostile cervical conditions, and ejaculatory dysfunction, have more advantages with the intrauterine insemination technique.

The IUI procedure is composed of several steps; ovarian stimulation, triggering ovulation following follicular tracking, sperm preparation, insemination and resting. Synthetic ovarian stimulants are used to stimulate ovaries. Ovulation triggering can be achieved using human Chorionic Gonadotropin (HCG) (6). Processed sperms are introduced to the uterus at the time of the ovulation. In Sri Lanka, intrauterine insemination (IUI) is a well-known fertility treatment technique used in many fertility treatment clinics.

There are two main methods to process raw semen samples, the density gradient method and swim up method. The density gradient method is considered best to select good-quality spermatozoa (7). This method is mostly used for patients with low initial sperm counts in order to concentrate good quality sperms.

The results obtained through the density gradient method are more consistent and easier to standardize than swim-up or other processing methods.

Published literature shows controversial associations between sperm parameters (sperm concentration, motility etc. and the intrauterine insemination success rate (IUI-SR). Different sources have suggested different correlations between IUI-SR and demographic factors such as age of the female partner, number of IUI attempts, sperm parameters such as sperm concentration, sperm motility, sperm morphology, sperm count, and sperm vitality related to IUI-SR (9). According to Advanced Fertility center of Chicago, the first IUI attempt is the most effective IUI attempt to gain a successful IUI pregnancy (9). Also, the IUI success rate after three IUI attempts is much lower than first three. Related to female age, a high IUI-SR can be achieved with age of female below 30 years of age and advancing female age has negative impact on IUI-SR(9). Total motile perm count >20 million has shown high IUI-SR compared to 5-10 million and 10-20 million (9).

The purpose of the present study was to explore the association of demographic factors such as the age of the female partner, number of IUI attempts, and period of abstinence from last ejaculation, and pre-processed sperm parameters such as concentration, total motility, progressive motility, non-progressive motility, sperm morphology, viability, total sperm count; further the post-processed sperm parameters such as concentration and percentage of progressive sperm motility with IUI-SR which identified through SFA and with semen processed through density gradient method.

Materials and Methods

A descriptive retrospective study was conducted including 140 SFA reports and the corresponding IUI reports of couples who underwent IUI treatment at the Fertility and Andrology clinic of the Professorial unit of Colombo South Teaching hospital, during January 2017 to August of 2021. The sample size was calculated using the Cochran Formula for sample size calculation. The statistical power of the study or the probability to reject the null hypothesis was (not to commit type 2 error) was high with acquired sample size (140) of the study which mentioned in the results section. The Cronbach's Alpha value of the study was 0.849 with a significance of $P < 0.05$. So the internal consistency was "Good" and the research tool was reliable. All IUI reports related to couples with female factor infertility such as tubal patency, ovulation failures, endometriosis, polycystic ovarian syndrome and etc., and the IUIs which did not have the corresponding SFA report were excluded from the study. The ethical clearance was obtained from the Ethics Review Committee of Colombo South Teaching hospital.

The considered key factors of the study were categorized into three main categories, demographic factors, pre-processed sperm parameters and post-processed sperm parameters. The data of demographic details (age of the female partner, period of abstinence from ejaculation, number of IUI attempts), pre-

processed sperm parameters (sperm concentration, percentages of total, progressive, non-progressive sperm motilities, percentage of normal form of sperm morphology, percentage of sperm viability, total sperm count), post-processed sperm parameters (concentration and percentage of progressive sperm motility) and pregnancy status were systematically extracted to a pre-designed data extraction form, from the SFA and IUI registries which were available in the Fertility and Andrology clinic of CSTH. Pregnancy status has been confirmed by urine or blood HCG (Human Chorionic Gonadotropin) tests. The data were analysed with the correlation test, cross-tabulation, and frequency test using the SPSS statistical software version 22.0.

Results

Out of 140 study samples, 26 (18.57%) reported IUI pregnancies were noted. The mean age ±SD of females and males were 33.28±6.00 and 35.28±5.29 years respectively. Female age factor was stratified into five categories for the purpose of statistical analysis. A significantly high IUI-SR was noted (Pearson correlation= 0.310, p=0.000) when the age of the female partner is less than 30 years compared to females aged above 30 years. The number of IUI attempts was stratified into seven categories from one to seven, according to the IUI attempt number. A significantly (Pearson correlation=0.180, p value=0.017) high IUI-SR was noted with the first two IUI attempts compared to multiple IUI attempts (more than two IUI attempts).

Figure 01: Distribution of age categories of females and corresponding pregnancy success.

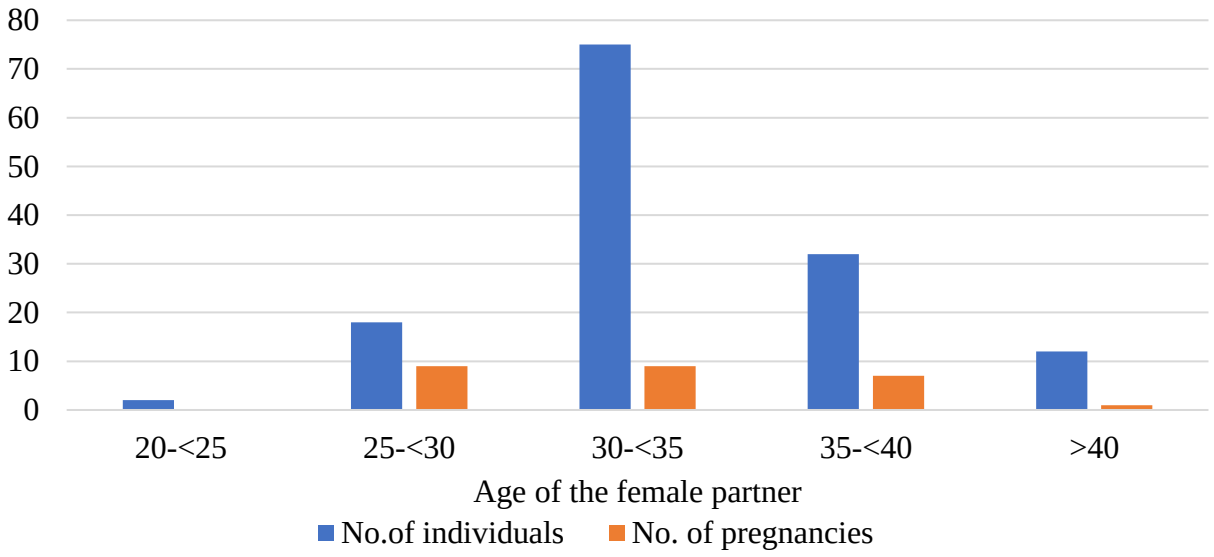
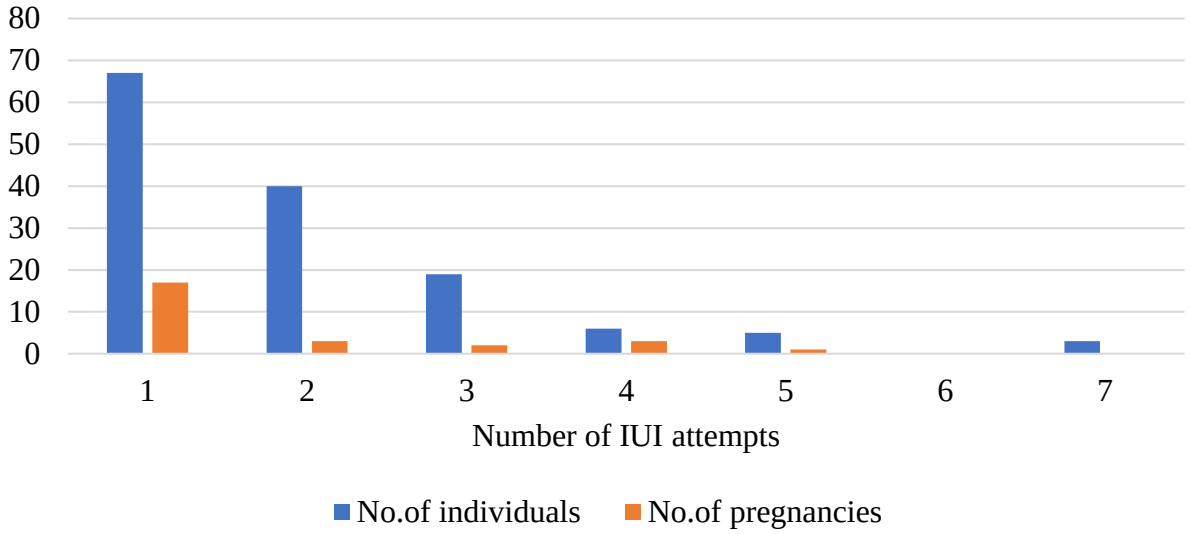
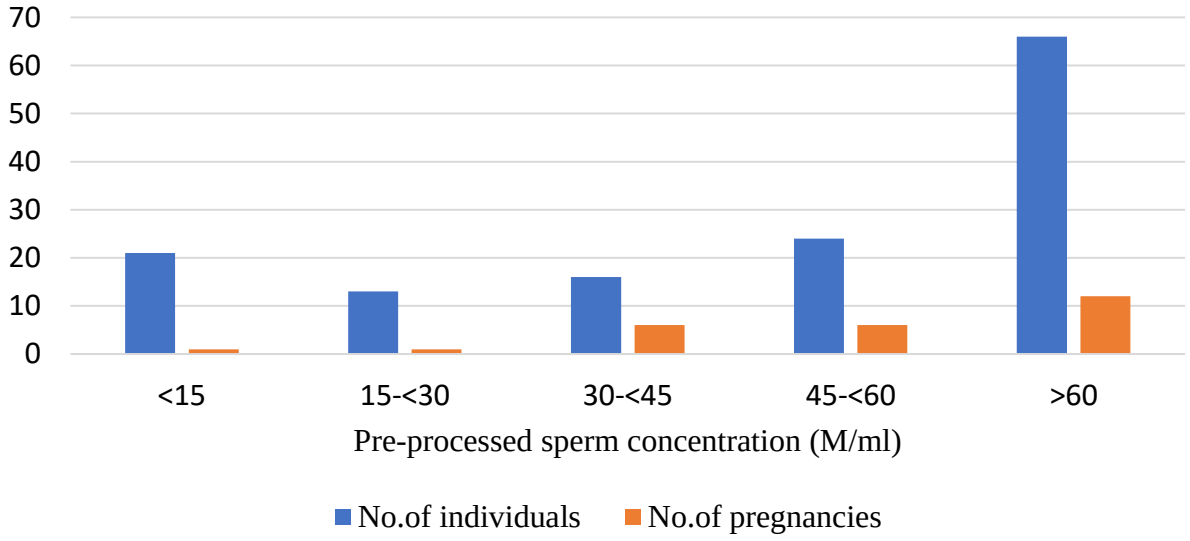


Figure 02: Distribution of number of IUI attempts and corresponding IUI success.



Pre-processed sperm concentration was categorized into five groups. A significantly (Pearson correlation=0.175, p- value=0.019) high IUI-SR was noted when the pre-processed sperm concentration is more than 30 million/ml compared to less than 30 million/ml.

Figure 03: Distribution of categorized pre-processed sperm concentrations and corresponding IUI success



Percentages of pre-processed total sperm motility were stratified into three categories, 0-39 %, 40-80 %, and more than 80 %. A significantly high IUI –SR (Pearson correlation=0.149, p=0.039) was noted, when pre-processed total sperm motility is above 40 % compared to less than 40% of pre-processed total sperm motility. Also, pre-processed progressive sperm motility was stratified into three categories, 0-31%, 32-64% percentage, and more than 64%. The lower reference values for

progressive sperm motility suggested by the Human semen processing and analysis laboratory manual 2021, World Health Organization17, were used for the above categorization.

A significantly high (Pearson correlation=0.155, p value=0.034) IUI-SR was noted when the percentage of progressive sperm motility is more than 32% compared to less than 32%. Pre-processed non-progressive sperm motility was stratified into three different categories as, 0-7 %, 8-15 %, and more than 15%. A significantly (Pearson correlation=0.227, p value=0.003) high IUI-SR was noted when pre-processed non-progressive sperm motility is less than 15 % compared to more than 15% of pre-processed non-progressive sperm motility.

Table 01: Distribution of different categories of pre-processed total, progressive and non-progressive sperm motilities and corresponding IUI success

Sperm motility parameter		Total number of couples	Total number of successful pregnancy
Total (%)	0-39%	21 (15.0%)	01 (4.7%)
	40%-80%	119 (85.0%)	25 (21.0%)
	>80%	00 (0%)	00 (0.0%)
Progressive (%)	0-31%	30 (21.4%)	02 (13.3%)
	32%-64%	104 (74.3%)	23 (22.1%)
	>64%	06 (4.3%)	01 (16.6%)
Non-progressive (%)	0-7%	40 (28.6%)	03 (7.5%)
	8%-15%	86 (61.4%)	22 (25.5%)
	>15%	14 (10.0%)	01 (7.1%)

However, parameters such as the period of abstinence from ejaculation, pre-processed total sperm count, percentage of the pre-processed normal form of sperm morphology, percentage of pre-processed sperm viability, post-processed sperm concentration, and percentage of post-processed progressive sperm motility did not show any significant association with IUI-SR. The period of abstinence from ejaculation was categorized into four categories, less than 2 days, 2-4 days, 5-7 days, and more than 7 days. However, there was no significant association (Pearson correlation=-0.065, p-value=0.222) was noted between the period of abstinence from ejaculation and the IUI-SR. The percentage of the pre-processed normal form of sperm morphology was stratified into three categories, 0-3 %, 4- 32 %, and more than 32%. However, there was no significant association (Pearson correlation= -0.118, p value=0.082) noted between the IUI-SR and

the percentage of the normal form of sperm morphology.

The percentage of sperm viability was categorized into two categories, 0-58%, and more than 58%. However, there was no statistically significant association (Pearson correlation=0.112, p value=0.093) noted between the IUI-SR and the percentage of sperm viability. When considering post-processed sperm concentration and IUI-SR, the analysis of different categories of post-processed sperm concentrations (less than 30- less than 45 million/ml, 15 million/ml, 15- less than 30 million/ml, 45- less than 60 million/ ml and more than 60 million/ml) did not show statistically significant use to predict the (Pearson correlation= 0.080, p value=0.175) IUI-SR. Finally, the percentage of post-processed progressive sperm motility was stratified into four categories, 0-31%, 32-64%, 65-96 %, and more than 96%. However, there was no statistically significant use of post-processed progressive sperm motility (Pearson correlation= 0.081, p value=0.172) to predict the IUI-SR.

Discussion

The study sample was composed of a total of 140 SFA reports and the corresponding IUI reports of couples who visited the Fertility and Andrology clinic of the Professorial unit of Colombo South Teaching Hospital from January 2017 to August 2021. The total IUI-SR of the present study was 18.57% (n=26). A significantly high IUI-SR was noted when the age of the female partner below 30 years of age compared to more than 30 years of age, with first two IUI attempts compared to multiple IUI attempts (more than two), pre-processed sperm concentration above 30 million/ml compared to less than 30 million/ml, sperm motilities of total above 40% compared to less than 40%, progressive above 32% compared to less than 32% and non-progressive less than 15% compared to more than 15%. However, the period of abstinence from ejaculation, pre-processed total sperm count, percentage of the normal form of sperm morphology, post-processed sperm concentration, and percentage of post-processed progressive sperm motility shows no significant use to predict the IUI-SR.

According to published literature (9) the IUI-SR is generally 15% to 20% of total IUIs. When considering the age of the female partner and IUI-SR, a significantly high IUI-SR was noted in the present study, when the age of the female partner is less than 30 years compared to more than 30 years. A recently published study (10) has concluded that the female age as one of the most predictive factors of the IUI-SR. Above finding strengthens the findings of the present study. In the present study, a significantly high (Pearson correlation=0.180, p value=0.017) IUI-SR was noted with the first two IUI attempts compared to multiple IUI attempts. Interestingly, with fourth IUI attempt an unusually high IUI-SR (50.0%) was observed in the present study. This odd (OR=0.271) value may perhaps be due to a less number of participants in the fourth IUI category. Literature (11) suggests that the number of IUI needed for a couple should be an individualized factor depending on the type of infertility. It is also stated that (11) the IUI-SR appears as a plateau after 05 IUI attempts,

in a graph of IUI-SR with number of IUI attempts. When considering the pre-processed sperm concentration and IUI-SR, a significantly (Pearson correlation=0.175, p-value=0.019) high IUI-SR was noted if the pre-processed sperm concentration is more than 30 million/ ml compared to less than 30 million/ ml.

In the present study, a significantly high IUI-SR was noted when pre-processed sperm motility of total above 40% compared to less than 40%, progressive sperm motility more than 32% compared to less than 32%, and non-progressive sperm motility less than 15% compared to more than 15%. According to a published literature (12), pre-processed sperm motility should be above 30% compared to less than 30% to obtain a significantly (p-value=0.001) high IUI-SR. Further, according to study (13), if the percentage of pre-processed sperm motility is 24 ± 22 %, a significantly high IUI-SR can be achieved (p=0.0001) However, according to study (14) (p-value=Not significant) the IUI-SR has no significant association with the percentage of pre-processed sperm motility. Nonetheless, most of the published literatures have shown a significant association between the IUI-SR and the percentage of pre-processed progressive sperm motility. The present study results show a negative correlation between IUI-SR and pre-processed total sperm count. A recent study (15) has shown a negative correlation between the pre-processed sperm count and the IUI-SR.

Conclusions

A significantly high IUI-SR can be achieved when the age of the female partner is < 30 years of age, with the first two IUI attempts, pre-processed sperm factors of concentration >30M/ml, total sperm motility >40%, progressive sperm motility >32%, and non-progressive sperm motility <15%. Interestingly, period of abstinence from last ejaculation, pre-processed sperm factors such as percentage of sperm viability, the percentage of normal form of sperm morphology, post-processed sperm concentration, and the percentage of post-processed progressive sperm motility have no significant value in predicting the IUI-SR.

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Conflict of Interest

None declared

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Accuracy of estimated height from ulnar length using MUST equation

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Running Title - Accuracy of estimated height from ulnar length using MUST equation

Abstract

Background & Aim: Height is an important parameter in the assessment of nutritional status. Height is difficult to measure directly in critically ill patients; alternative methods are used to predict the height. One such method used in the Sri Lankan setting is the Malnutrition Universal Screening Tool (MUST) equations using ulnar length. But the accuracy of the estimated height from the ulnar length in local setting is not studied much. The present study is carried out as a pilot study in order to evaluate the equation for estimated height from ulnar length for the Sri Lankan population.

Methods: A single-centre cross-sectional study was carried out by using hospital staff in a base hospital in the central province of Sri Lanka during a staff clinic session. Height was measured by a stadiometer (Seca-203) and ulnar length non-stretchable tape. MUST equation was used the calculate the estimated height and it was compared with actual height to check the accuracy.

Results: The mean age of the males and females is 39.8 (SD ± 10.2) and 40.7 (SD ± 10.0) years, respectively. The actual height of males was 165.6 cm (SD ± 6.2) and 153.8 cm (SD ± 5.6) in females. The estimated height in males is 175.6 cm (SD ± 4.9) and in females 165.3 cm (SD ± 4.7). The mean difference of estimated height was positive 10.0 cm (SD ± 5.1) in males and in females, it is 11.5 cm (SD ± 4.4).

Conclusions: The estimated height from ulnar length in this subgroup differs significantly from the actual height. Therefore, MUST equation should be used cautiously until a further countrywide assessment is done to develop a population-specific equation to predict height using ulnar length.

Keywords: Estimated height, Ulnar length, Anthropometry, Sri Lanka, MUST equation

Introduction

Height is a widely used anthropometric parameter. It is used to calculate body mass index (BMI), body surface area and ideal body weight (IBW). The standard method of height measurement is a stadiometer. But in an acute setting and when the patient can't stand, height measurement is not possible. There are

multiple indirect methods of estimation of height by using other anthropometric parameters like ulnar length, knee height, arm span and demi-span. Ulnar length is a relatively easy parameter to assess in most conditions and has a good correlation with height. Ulnar length is the measurement between the olecranon process and the styloid process (1). Several equations estimate height from the ulnar length, but the Malnutrition Universal Screening Tool (MUST) equation is more widely used to estimate height by ulnar length (2). It was developed by the Malnutrition Advisory Group, a standing committee of the British Association of Parenteral and Enteral Nutrition (BAPEN). The study population used to create the MUST equation is the white British population (2). Sometimes it is not compatible with other populations; countries like Vietnam, Nepal, Turkey and Portugal had found that the MUST equation is not compatible with their population and had developed country-specific equations (3)(4)(5)(6). Even though the MUST equation is commonly used in the Sri Lankan setup, the accuracy of the estimated height is not evaluated. This study was carried out to identify the accuracy of predicted height by MUST equation in Sri Lankan population.

Methodology

The study was carried out in the central province of Sri Lanka in the base hospital Gampola by using hospital staff during a staff clinic session in early 2020. There were 368 (111–males, 255–females) participants. They all were adults between 18 and 60 years; participants over 60 years and who had chronic illnesses or disabilities were excluded from the study. Stadiometer (Seca-203) and a non-stretchable tape were used to measure the height and ulnar length, respectively, by trained personnel using standard methods. The ulnar length was measured from the tip of the olecranon process to the midpoint of the styloid process, on the non-dominant hand by keeping the hand flexed and palm across the chest, fingers pointing to the opposite shoulder (8). Before the study, informed consent was taken from all participants, and ethical clearance was obtained from the national hospital Kandy ethics review committee. Estimated height and actual height were compared by using SPSS version 25.

The ulnar length was measured from the tip of the olecranon process to the tip of the styloid process, with the elbow flexed and the palm spread over the opposite shoulder.

Results

The mean age of the males and females was 39.8 (SD ± 10.2) and 40.7 (SD ± 10.0) years, respectively. The actual height of males was 165.6 cm (SD ± 6.2) and 153.8 cm (SD ± 5.6) in females. The mean ulnar length of males was 26.8 cm (SD ± 1.4) and in females, 23.9 cm (SD ± 1.3).

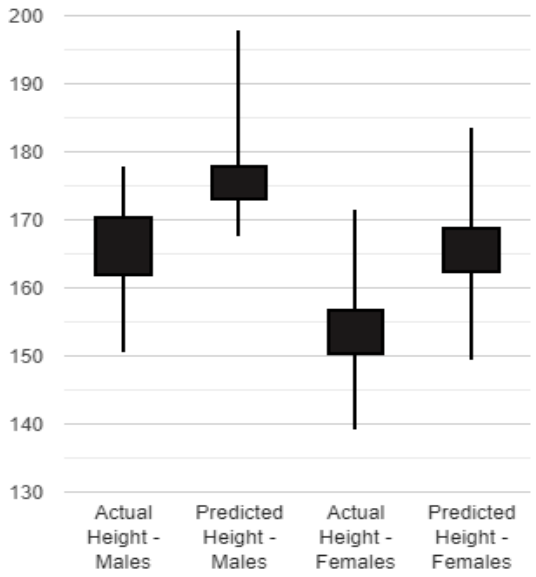
Predictive height was calculated using the MUST equation using ulnar length; males and females had two different equations (7).

Predicted height males (cm) = 79.2 + [3.60 ×ulna length (cm)]

Predicted height females (cm) = 95.6 + [2.77× ulna length (cm)]

The mean estimated height in males was 175.6 cm (SD ± 4.9) and in females 165.3 cm (SD ± 4.7). There was a positive 10.0 cm (SD ± 5.1) difference between means of estimated height and actual height in males and in females it was 11.5 cm (SD ± 4.4).

Table 1. Difference between actual height and estimated height in males and females



The correlation between actual height and ulnar length was showed a strong positive correlation in males (r – 0.6) and in females (r – 0.66); both had a p-value of <0.0001.

Discussion

The findings suggest that there is a significant positive overestimation of predictive height when calculated using the MUST equation in this population. Sri Lanka is listed as one of the countries with the shortest average height (8). According to the world population review, the average male height of the Sri Lankan population is 168 cm and females average height is 156 cm (8). But the British population height is significantly higher than this, which is around 178 cm for men and 163 cm for women (8). This height difference between the reference population for the equation development and the study population may be the cause for the estimated height difference from the actual height. But as this study population does not represent the entire Sri Lankan population, a large-scale countrywide study may give a better picture of the difference. This study's findings highlight the need for a population-specific equation to estimate height using ulnar length for the Sri Lankan population.

Along with the findings of other studies, it is almost certain that a single anthropometric equation does not fit for entire worlds population due to genetic, ethnic, dietary, climatic and other innumerable differences. It is high time to develop the country and population-specific equation to estimate height from ulnar length for the Sri Lankan population.

Conclusion

- There is a strong positive correlation between ulnar length and actual height.
- Calculated height by using the MUST equation gives a significantly higher estimation of height in this subgroup of Sri Lankan adults.

- Population-specific equations to estimate height will give a more accurate estimation.

Acknowledgement

Dr. Renuka Jayatissa, Prof. Ranil Jayawardhana and Dr. Lanka Ranaweera for the guidance given to make this study successful. Dr. Eranda Cabral, Dr. C. Gunasinghe, Dr. S. Mobeersanth and Dr. L.M Ranaweera for the continuous support throughout the process.

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Conflict of Interest

None declared

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'An extra-skeletal Ewing's Sarcoma presenting with urinary retention- Impact of anatomical location on patient management; A case report'

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Running title - 'An extra-skeletal Ewing's Sarcoma presenting with urinary retention; A case report'

Abstract

Background: Ewing's sarcoma is one of the common malignant childhood tumours. The radiological features of pre-sacral Ewing's sarcoma may mimic primary nerve sheath tumor or teratoma.

Case Presentation: A 16-year-old girl presented with acute retention of urine found to have a midline mass in the pre-sacral region of the pelvis in clinical examination and radiological scans. A preoperative biopsy was not done. The complex location and the need to excise the biopsy tract, if histology turned out to be malignant, predicated this decision. The tumor was entirely excised. The histological diagnosis was that of an Ewing's Sarcoma, with focal infiltration of the surgical margins.

Conclusion: The anatomical site and size of an Ewing's sarcoma should be considered before preoperative biopsy is considered. A biopsy result positive for malignancy would favor adjuvant chemotherapy and radiation, but requires the biopsy tract to be excised. Primary resection is the preferred choice when the location is complex.

Keywords: Ewing's Sarcoma, retroperitoneal pelvic mass, urinary retention, anatomical location, primary resection

Background

Ewing's sarcoma is one of the common malignant childhood tumour, which is named after James Ewing who described it in 1920 (1). Along with osteosarcoma, it is the second most common malignant bone tumor in children (2). ES can occur in virtually any location of the body (3). However, a pre sacral mass causing acute urinary retention is a very rare presentation (4). The radiological features of pre-sacral Ewing's sarcoma may mimic primary nerve sheath tumor or teratoma. The management of Ewing s sarcoma most of the time is histological confirmation followed by neo adjuvant chemotherapy / radiotherapy and surgical excision. However a tailor made

approach would be effective and safe depending on the different anatomical sites and sizes.

Case Presentation

A 16-year-old girl presented with acute retention of urine. She had no constitutional symptoms like loss of weight or appetite. A digital rectal examination revealed a pre-sacral mass. A Contrast enhanced computed tomography (CECT) of the pelvis showed a well-defined, heterogeneously enhancing, midline mass in the pre-sacral region. It measured 9cm x 6.5cm x 6cm in size. It consisted of solid and cystic areas, but there were no foci of calcification. The mass was overlying the anterior surfaces of 2nd to 5th sacral vertebral bodies and was seen to communicate with the sacral spinal canal. The CECT appearance was that of a pre-sacral tumor, suggestive of a schwannoma or a teratoma. The Magnetic Resonance Imaging (MRI) scan (Figure 1) confirmed the CECT findings, but showed no evidence of bony erosions, usually associated with a peripheral nerve sheath schwannoma.

Figure 1- MRI Scan of Abdomen and Pelvis showing the extent of the tumour within the pelvis.

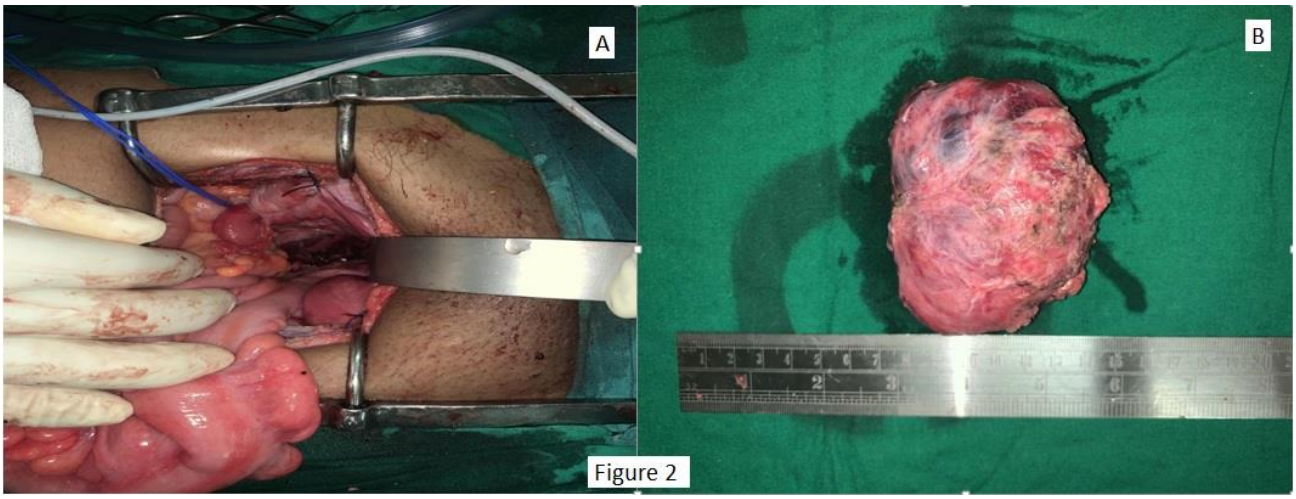

Figure 2- Intraoperative view of the tumour being transected (A) and the resected mass (B).

The patient made an uneventful recover and was referred to the oncology service for further management. The histological diagnosis was that of an Ewing's Sarcoma (Figure 3 & 4), with focal infiltration of the surgical margins.

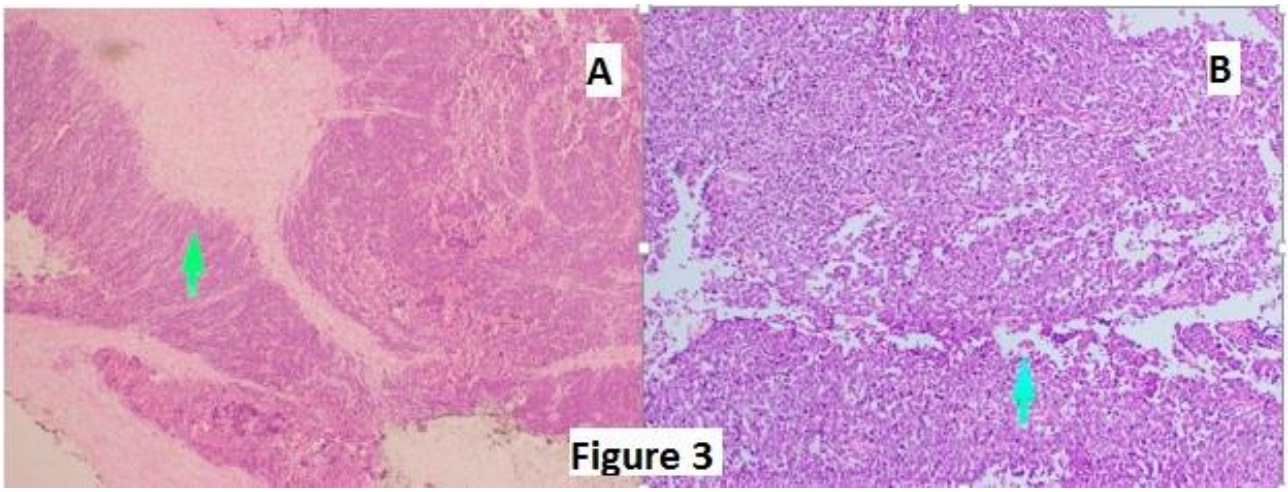

Figure 3- Histopathological slides showing neoplasm composed of sheets of small round cells separated into vague nodules by fibrous septae. Cells contain round nuclei with coarse chromatin pattern. The mitotic activity is brisk (A & B).

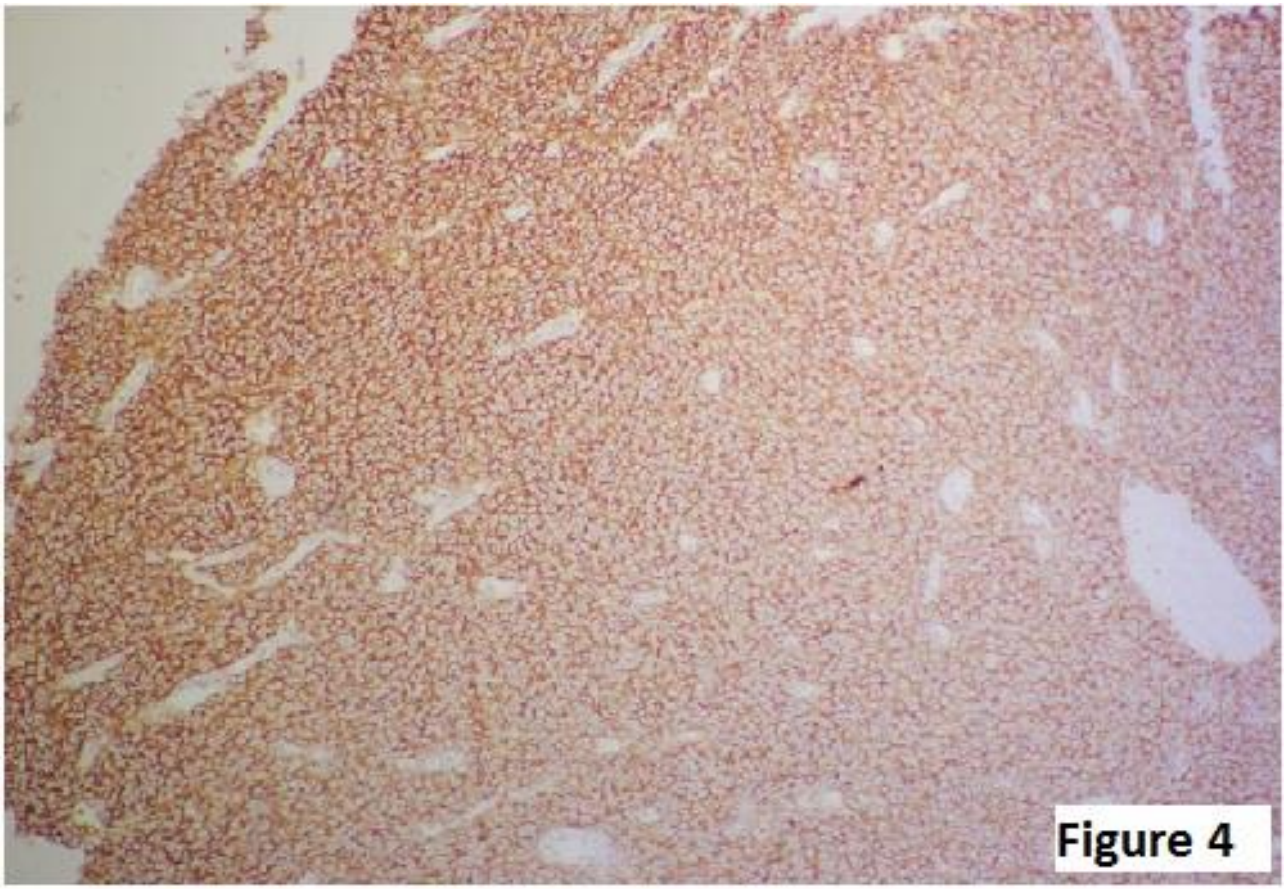

Figure 4 – The immune stain slide that showing diffuse cytoplasmic positivity of tumour cells.

She was commenced on chemotherapy followed by radiotherapy. A repeat CT confirmed complete excision of mass.

Conclusion

The CECT and MRI images in our patient were strongly suggestive of a benign schwannoma or teratoma and the presentation with urinary retention had made schwannoma the most likely possibility. However, the radiology report had stated that a malignant tumor could not be excluded. The decision to proceed directly to laparotomy had been strongly influenced by the highly suggestive radiological findings. Pre-operative ultrasound guided biopsy, via a trans-rectal or percutaneous route, was considered. Due to the position of the tumor, a percutaneous biopsy via the posterior abdominal wall was considered the safest option. However, if the histology had proved the tumor to be malignant, comprehensive resection would have required excision of the entire biopsy tract as well. This would have been a significant surgical challenge, regardless of the approach used to biopsy the tumor. In this instance, diagnosis of ES was only made post-operatively.

A pre-surgical histological diagnosis may have changed management, to include radiotherapy and neo-adjuvant chemotherapy (5). This may have provided a better outcome with regard to local recurrence and survival. However, we believe the benefit to our patient would have been marginal, as the tumor was successfully resected in its entirety.

The anatomical site and size of an Ewing's sarcoma should be considered before preoperative biopsy is considered. A biopsy result positive for malignancy would favor adjuvant chemotherapy and radiation, but requires the biopsy tract to be excised. Primary resection is the preferred choice when the location is complex.

List of Abbreviations

ES – Ewing's sarcoma
CECT - A Contrast enhanced computed tomography
MRI- The Magnetic Resonance Imaging

Acknowledgements

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Competing Interests

The authors declare that there are no competing interests.

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Preparing low-cost cadaveric cross-sections for integrated teaching and learning of cross-sectional radiological anatomy and gross anatomy in medical education

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Running Title: Preparing low-cost cadaveric cross-sections

Abstract

The study of cross-sections in orthogonal planes lay a solid foundation for a 3-dimensional approach to learning anatomy and helps correlate with radiological cross-sectional images. We aimed to develop instructional material for such teaching/learning using a low-cost method for cross-sectioning. Cross-sections of preserved frozen cadavers were obtained analogous to CT imaging planes, and subsequently paired with corresponding radiological images for comparison. Hence, this cost-effective method can be used to develop resources for teaching both cross-sectional and radiological anatomy.

Keywords: medical education; anatomy; radiology; cross-sections; low cost

Integrating anatomy and radiology teaching in medical education has recently gained much attention and popularity, with medical educationists highlighting the benefits of such blended learning toward achieving higher learning outcomes in both subjects. Blending radiology with conventional anatomy teaching generates student interest in learning anatomy and highlights the clinical relevance of learning anatomy (1). Such integrated teaching curricula also prepare students for the knowledge and skills needed to interpret radiological images (1). Although competence in understanding basic radiological images is a current need for a medical practitioner it has been found in a US study that only 5% of the time span of the undergraduate teaching is allocated for radiology (2). Therefore, it is prudent to pursue methods for better teaching of radiology at the undergraduate level (1).

In addition to conventional cadaveric dissections, the study of cadaveric cross-sections in orthogonal planes helps lay a solid foundation for a 3-dimensional approach to learning the anatomy of internal structures and their relationships (3). Subsequent correlation of the gross anatomical cross-sections with radiological images such as computed tomograms (CT) and magnetic resonance images (MRI) enhances in-depth understanding of the radiological anatomy by escalating higher-order thinking skills (4).

With the introduction of cross-sectional anatomy in the basic science curricula, the University of Vermont, USA strived to develop cadaveric cross-section and corresponding radiological images-based teaching-learning materials since the 1940s (5). Hand saws were traditionally used to

obtain human cross-sections using embalmed, frozen cadavers, which produced approximately 2.5 cm thick slices (5). With the recent advances of technology, laser-based devices have been introduced to obtain ultra-thin cross-sections of the human cadavers. The Visible Human Project is one such landmark study where thin cadaveric cross-sections (1 mm thin sections of a male and 0.33 mm thin sections of a female) were obtained in the axial plane and subsequently used to correlate with CT and MRI for educational and research purposes (6). However, these cross-sectioning techniques are expensive and are not affordable to many developing countries. Consequently, there is a ubiquitous need for the university system to embrace cost-effective mechanisms to produce instructional material based on cadaveric cross-sections which can be utilized to compare with the radiology sections. Therefore, the objective of this project was to develop a low-cost method for obtaining serial cross-sections of a human body in order to produce such instructional material.

This project was made up of three phases. In phase 1, a machine was developed in-house to obtain cadaveric cross-sections. It is made up of three components: a mounting table with a sliding mechanism, a shock-absorbing system, and a cutting system. Special features included a series of cutting blades for different tissue compositions, a system of rubber shock absorbers to dampen vibrations and minimize distortion of the cut surface of the tissues, a special lubricant to minimize cohesion of tissues during sectioning, and a guard fitted to the sliding machinery to ensure safety. In phase 2, the cadavers were preserved by injecting a Phenoxymethanol-based preservative solution into the femoral artery and were frozen at -20 0C for 24 hours before sectioning [the method of preservation is described elsewhere in detail (7)]. Cross-sections obtained analogously to CT imaging planes were carefully washed with running water at room temperature and displayed in 10% formaldehyde-filled Perspex boxes avoiding air trapping. In phase 3, the serial cross-sections were paired with the corresponding radiological images for comparison and correlation (Figure 1).

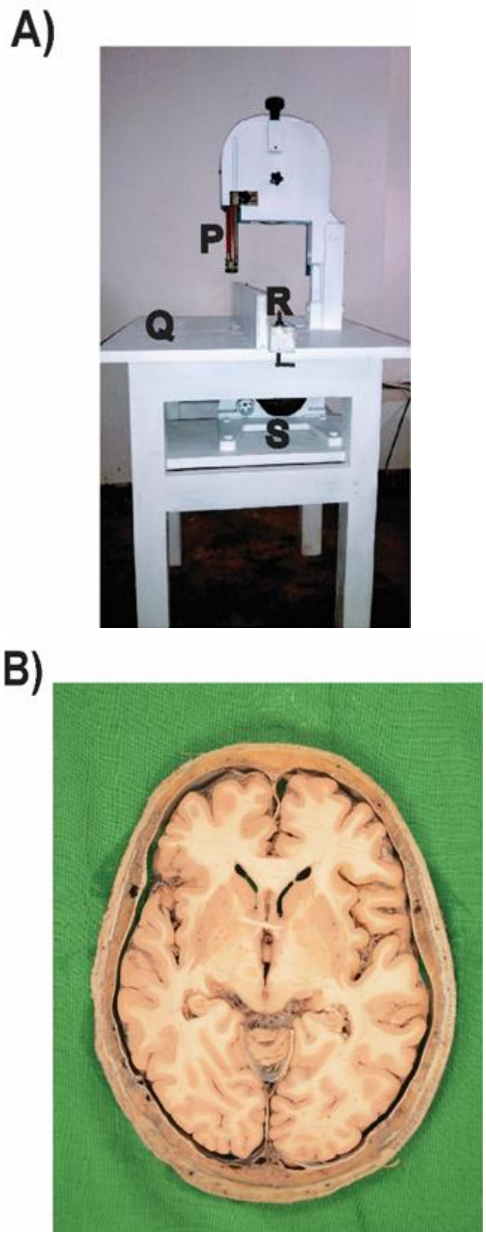

Figure 1: Processing cadaveric cross-sections for educational material | A) The machine which was developed in-house to obtain cadaveric cross-sections B) An axial section of the brain at the level of the basal ganglia C) Educational material to compare and correlate cadaveric cross-sections with radiological images fit in a foldable container (left). This axial section is at the level of the hip joints. A line diagram is provided with the legends to facilitate self-learning (right).

This machine was built without the demand for complex technology; hence, it is possible for the majority developing countries to produce a similar instrument with existing resources and minimum technical expertise. The production cost of the developed machine was approximately 50 000 LKR (250 USD) and the subsequent preservation procedure was not demanding. Two point seven millimetre thin cross-sections could be obtained without distortion of the tissue architecture where structures as minute as 1-2 mm could be identified with their relations preserved (7, 8). There was remarkable colour preservation and the specimens could be easily compared with the corresponding radiological images for teaching-learning purposes. Therefore, this cost-effective and safe method can be used to develop resources to integrate teaching of radiology and anatomy. Further studies are required to explore the efficacy of such innovative material in understanding 3-dimensional and radiological anatomy in the basic sciences curricula.

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Conflicts of Interest

The authors declare that there are no conflicts of interest.

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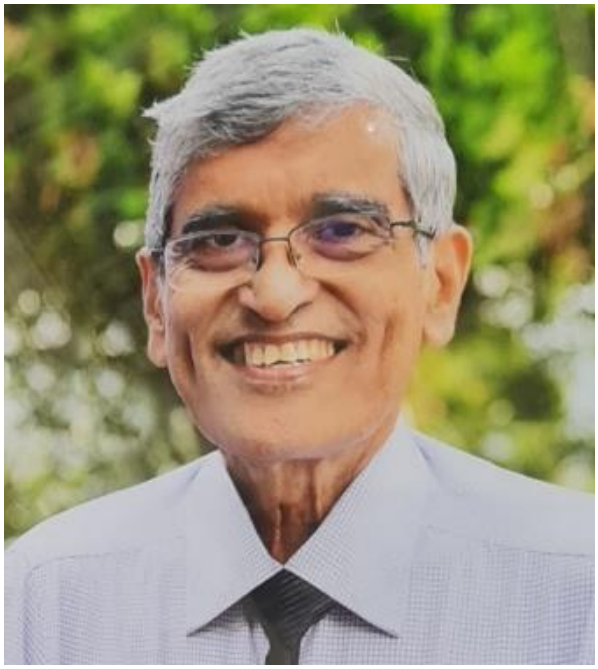
TRIBUTES

A tribute to a Sri Lankan legend in anatomy – Professor Tilak Richard Weerasooriya 20/11/1950 to 20/02/2022



Tilak Richard Weerasooriya,
Emeritus Professor of Anatomy,
Faculty of Medicine,
University of Ruhuna.

Emeritus Professor Tilak Richard Weerasooriya, beloved husband of Emeritus Professor Mirani Vasanthamala Weerasooriya and beloved father of Senal, Sahan and Semali Weerasooriya started his career as a Probationary Lecturer in Department of Anatomy, Faculty of Medicine, University of Peradeniya, his alma mater and subsequently joined Department of Anatomy Faculty of Medicine, University of Ruhuna.

After completing his postgraduate studies in Japan, he served Faculty of Medicine, University of Ruhuna in the capacity of a Senior Lecturer, a Professor and a Senior Professor in Anatomy teaching generations of undergraduates “the art of learning Anatomy.”

Being a man abide by rules, he successfully held the position of Dean, Faculty of Medicine, University of Ruhuna from 2008 to 2011. During this period, his visionary leadership contributed immensely for the establishment of Faculty of Medicine at the General Sir John Kotelawala Defence University.

His pioneering work on Andrology, changed the lives of many families in the South. Apart from being an Anatomist and an Andrologist, he was a master musician & singer, a dancer, a chef, a marksman, a carpenter, and an angler, and above all a remarkable human being.

His skillful touch, gentle ways, humble nature and strong decisions taught lessons to many of us to shape our lives as professionals. Though we are sad by his early departure, we are ever so thankful to him for being such an extra-ordinary character capable of changing the lives of people around him.

Enjoying every moment in life: it was indeed a life well-lived!

May he rest in Peace!

Prof. E.I. Waidyarathne,
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INSTRUCTIONS TO AUTHORS

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

1. Leading articles - One article per issue. It may be solicited by the Editor. Authors are welcome to submit leading articles on current topics of interest. One's expertise or commentaries on general experiences etc. They should be approximately 1500 words in length. References should be 20 or less.

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3. Research articles - Articles resulting from research work belong to this group. Results from routine clinical examinations or laboratory investigations will not be considered under this category. They should not exceed 3000 words and 30 references. A reasonable number of tables and illustrations will be accepted.

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The manuscripts should be typed, double-spaced: on A4 (212x297 mm) paper and submitted in correct English: both British English and American spelling are acceptable, provided this is consistent throughout the manuscript. Manuscripts not submitted in proper format or in poor English may be returned without review. The format of a manuscript should be as follows: Title page, Abstract, Introduction, Material and Methods, Results, Discussion, Acknowledgements, References, Figure Legends and Tables arranged in that order.

Title Page –

The title page should contain the following information in the order given:

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

1. Objective: An introductory sentence indicating the objective and purpose of the study.
2. Material and methods: A description of experimental procedure including applicable statistical evaluation.
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Introduction –

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

Material and Methods –

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.

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Congress abstracts should not be used as references nor may “unpublished observations” and “personal communications” be placed in the reference list. References cited

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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

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