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ORIGINAL PAPER

Morphological Study of Human Spleen in Different Age Groups

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ABSTRACT

Spleen is the largest lymphoid organ. It is a haemo-lymphatic organ containing large amount of lymphatic tissues and plays a vital role in metabolism and defence mechanism of body. It is the largest lymphoid organ and its size varies with individuals' age, sex and underlying metabolic conditions. Spleen takes an important part in body immunity, as high incidences of serious bacterial infections were reported following splenectomy in infancy. A research work was carried out in the department of Anatomy, Gauhati Medical College. The morphological characteristics of 21 normal human spleens were studied in different age groups and to correlate them functionally. The specimen of spleen varies from newborn to eighty year old cadavers, within stipulated time limit after fulfilling the formalities. The spleens were first washed in normal saline, dried with blotting paper, weight was taken by electronic weighing machine and dimensions are measured by verniar calliper. The dimensions and weight were measured and statistically analysed. The recorded data were then statistically analysed using Student's T-test. P value 0.05 is considered as statistically significant. The data obtained in this study will help in certain medico-legal practices. This study may be used as a pedestal for further sophisticated studies.

***Keywords**: Human spleen, length , breath, thickness, weight*

INTRODCUTION

Spleen is a haemo-lymphatic organ containing large amount of lymphatic tissues and plays a vital role in metabolism and defence mechanism of body. It is the largest lymphoid organ and its size varies with individuals' age, sex and underlying metabolic conditions. The spleen is 12-15 cm long and 5-8 cm wide.[1] The spleen varies in shape from that of a slightly curved wedge (when the colic impression is small) to a tetrahedron (When the colic impression is large). In the adults, the spleen is usually about 12 cm in length, 7 cm in breath and 3-4 cm in thickness and its average weight is about 150 gm. It is larger in well fed animals but is smaller in starved animals.[2] The weight of spleen gradually declines in man, with a slight presenile increase at approximately 40-50 years of age.[3] The growth of lymphoid tissues (e.g.- thymus, spleen and pharyngeal tonsils) reaches its peak by about six to seven years which is nearly double of that seen in adult. Thereafter it regresses gradually upto puberty.[4] The weight of the spleen varies significantly; it is less in women than in men of corresponding age, the spleen reaches its maximum size in second decade of life than gradually involutes. The normal weight of human

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spleen varies from 50-250 gm.[5] Grossly the spleen may appear in a variety of shapes. It may be wedge shaped-44%, tetrahedral-42% or triangular-14% depending on its relationship with neighbouring organs during development.[6,7] At birth, the spleen weighs approximately 11gm. Thereafter it enlarges until puberty, reaching an average weight of 135 gm, before diminishing in size during adulthood.[8] The shape of spleen varies from a slightly curved wedge to a domed tetrahedron. The shape is mostly determined by its relations to neighbouring structures during development. The size and weight of spleen vary with age and sex.[9]

OBJECTIVES

(i) To see the morphological changes of length, breadth & thickness of human spleen in different period of life.

(ii) To see the morphological changes of weight of human spleen in different ages.

MATERIALS AND METHODS

Collection of specimen:

(i) From the department of Forensic Medicine, Gauhati Medical College, Guwahati, from the cadavers within stipulated time limit after fulfilling the formalities. Care was taken to collect the non-pathological specimens.

(ii) From the cases of neonatal deaths in the department of Obstetrics and gynaecology,

Method of weighing and measurement:

Spleens were first washed in normal saline, dried with blotting paper and weighed in an electronic weighing machine. The length, breadth, and thickness were measured by means of graph paper, scale, pin to locate the maximum length/breadth and vernier calliper mainly for thickness measured at the level of hilum of spleen.

Analysis:

The data recorded was analysed statistically using Student's T-test. *P* value 0.05 is considered as statistically significant

OBSERVATION & RESULTS

The results and observations of the present study is tabulated and graphed as follows:

Table 1 Average length, breadth & thickness of human spleen

Age group	Average value in cm		
	Length	**Breadth**	**Thickness**
Paediatric group (0 to 14 years)	4.41	4.13	1.99
Adult group (15 to 50 years)	12.05	7.13	3.34
Geriatric group (More than 50 years)	9.46	6.93	3.09
SUM	**25.92**	**18.19**	**8.42**

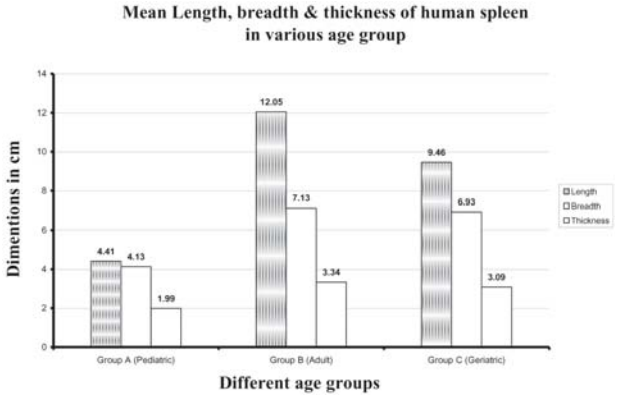

Figure 1 Mean value of different parameters

Table 2 Mean length of spleen in different age group

Class interval of different age group	Length		
	f (frequency)	**fr (relative frequency)**	**f% (percentage)**
Pediatric	4.414	0.171	17.100
Adult	12.057	0.465	46.500
Geriatric	9.457	0.364	36.400
SUM	**25.928**	**1.000**	**100.000**

In **table 2** for mean length of the spleen the highest relative frequency 0.465 is seen in the 'adult age group' with a simple frequency of 12.057 and percentage of 46.500 and the lowest relative frequency 0.171 is seen in the 'pediatric age group' with a simple frequency of 4.414 and percentage of 17.100 which is evedent in **Figure 2**

Table 3 Mean Breadth of spleen in different age group

Class interval of different age group	Breadth		
	f (frequency)	fr (relative frequency)	f% (percentage)
Pediatric	4.057	0.224	22.400
Adult	7.129	0.394	39.400
Geriatric	6.886	0.382	38.200
SUM	**18.072**	**1.000**	**100.000**

In **table 3** for mean breadth of the spleen the highest relative frequency 0.394 is seen in the 'adult age group' with a simple frequency of 7.129 and percentage of 39.400 and the lowest relative frequency 0.224 is seen in the 'pediatric age group' with a simple frequency of 4.057 and percentage of 22.400 which is evident in **figure 2.**

Table 4 Mean thickness of spleen in different age group

Class interval of different age group	Thickness		
	f (frequency)	fr (relative frequency)	f% (percentage)
Pediatric	1.929	0.231	23.100
Adult	3.371	0.401	40.100
Geriatric	3.086	0.368	36.800
SUM	**8.386**	**1.000**	**100.000**

In **table 4** for mean thickness of the spleen the highest relative frequency 0.401 is seen in the 'adult age group' with a simple frequency of 3.371 and percentage of 39.400 and the lowest relative frequency 0.231 is seen in the 'pediatric age group' with a simple frequency of 1.929 and percentage of 23.100 which is evident in **figure 2.**

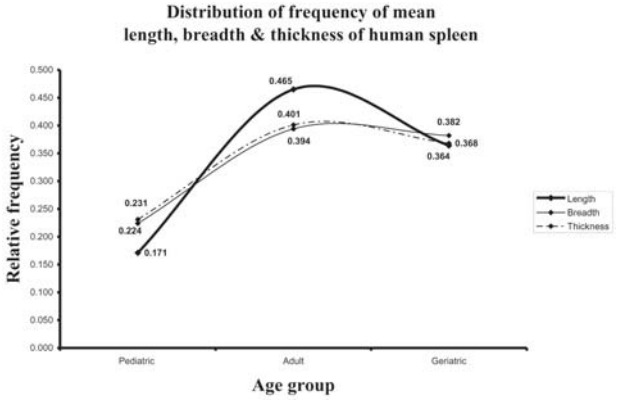

Figure 2 Distribution of relative frequency

Table 5 Average weight of human spleen

Age group	Average weight in gm
Paediatric group (0 to 14 years)	47.51
Adult group (15 to 50 years)	154.57
Geriatric group (More than 50 years)	133.86
SUM	**335.94**

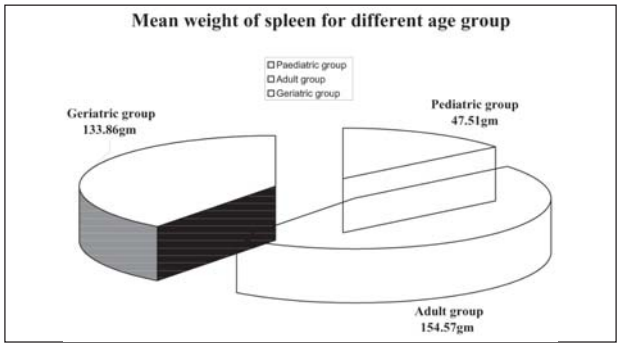

Figure 3 Mean weight of spleen

Table 6 Mean weight of spleen in different age group

Class interval of different age group	Weight		
	f (frequency)	fr (relative frequency)	f% (percentage)
Pediatric	47.51	0.142	14.200
Adult	154.57	0.460	46.000
Geriatric	133.86	0.398	39.800
SUM	**335.94**	**1.000**	**100.000**

In **table 6** for mean weight of the spleen the highest relative frequency 0.460 is seen in the 'adult age group' with a simple frequency of 154.57 and percentage of 46.000 and the lowest relative frequency 0.142 is seen in the 'pediatric age group' with a simple frequency of 47.51 and percentage of 14.200 which is evident in **figure 4.**

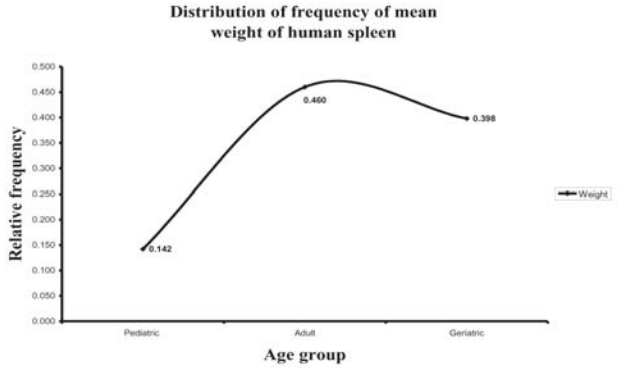

Figure 4 Distribution of relative frequency

Table 8 Level of significance of differences

Sl. No.	Comparison of mean between	"t"	P
1	Length of spleen in pediatric age group & adult age group	5.595	P<0.01
2	Length of spleen in adult age group & geriatric age group	4.490	P<0.01
3	Breadth of spleen in pediatric age group & adult age group	3.041	P<0.05
4	Breadth of spleen in adult age group & geriatric age group	0.759	P>0.05
5	Thickness of spleen in pediatric age group & adult age group	2.114	P<0.05
6	Thickness of spleen in adult age group & geriatric age group	1.686	P>0.05

DISCUSSION

Studies on length, breadth, thickness & weight of spleen in different age groups have been forwarded many by research workers. Observations suggests that the length, breadth and thickness of spleen reaches its maximum dimensions around puberty and it has quite peculiar growth curve.[10] That spleen reaches its maximum size in second decade of life then gradually involutes.[11,12] At birth spleen weight 10.7gms.[13] The growth of the organ follow a peculiar pattern which increases with age reaches the peak around puberty, then involutes.[14] After puberty involution of the organ started and decreases in its weight. The spleen reaches its maximum size in adult life then gradually involutes.[15] Our study is consistent with these universal observation.

Length, breadth, thickness and weight of spleen in different age groups been measured in matched sets of observation using the null hypothesis: Reject H_o if P +< $t_{á}$ when $t_{á}$ = $t_{0.05}$ setting the level of confidence at 95% probability signifying that if the differences in observation between the matched groups is significant at the level of P < 0.05, the hypothesis will be rejected establishing differences in length, breadth, thickness & weight of spleen between the tested groups.

CONCLUSION

The length, breadth and thickness of spleen in 'adult age group' increases than the 'pediatric age group' with high significance for length (P<0.01) and with significance (P<0.05) for breadth & thickness. Again the length of spleen in 'geriatric age group' decreases than the 'adult age group' with significance (P<0.05), but there is no significant decrease (P>0.05) in breadth and thickness of spleen in geriatric age group. The weight of the spleen also increases in adult age group highly, and then it decreases minimally in geriatric age group.

Finally, it can be concluded that size of spleen (length, breadth & thickness) and weight increases up to the end of fourth decade of life, then it starts shrinking mainly in length with minimal reduction of weight without much effecting the breadth and thickness.

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