Original Article

Variation of Diameter of White Pulp of Spleen of Different Age and Sex in Bangladeshi Cadaver

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Abstract :

Background: *Activation and proliferation of T cells and differetion of B cells and plasma cells , as well as secration of antiboidies occure in the white pulp of the spleen; in this regard, the white pulp is the equivalent of other lymphatic organs. The spleen is involved in all systemic inflammations, generalized hematopoietic disorders, and many metabolic disturbances. In each case, the spleen undergoes enlargement, which is the major manifestation of disorders of this organ. It is rarely the primary site of disease. Massive splenic enlargement frequently occurs in the tropics from malaria, Kala-azar and schistosomiasis, and need to medical and surgical intervention. So, detailed anatomical knowledge on spleen is very much important.* ***Objectives:*** *Histological changes are evident in advancing age along with functional capability of the human spleen.* ***Method:*** *This cross sectional descriptive study was done to measure the diameter of white pulp of spleen to establish the difference between sexes of different age groups in Bangladeshi cadaver. The study was carried out in the department of Anatomy, Mymensingh Medical College, Mymensingh from June 2013 to July 2014. A total 30 human spleen were collected by purposive sampling technique from October 2013 to April 2014, among them 14 were male and 16 were female. The specimens were collected from Bangladeshi cadavers of age ranging from 6 months to 60 years, from autopsy laboratory of the Department of Forensic Medicine of Mymensingh Medical College. For convenience of differentiating the diameter of white pulp of spleen in relation to age and sex, the collected specimens were divided into three groups like Group A (upto 20 years), Group B (21 to 40 years) & Group C (41 to 60 years). Each group was again divided into male & female groups. In this study 10 slides from each age group were chosen for measuring the diameter of white pulp of spleen and examined under low power objective.* ***Results:*** *In present study the mean (±SD) diameter of white pulp was 472.35±62.68, 461.93±42.71 and 437.27±46.86µm in Group A, B and C respectively. The maximum diameter in Group A, 180.25µm in Group B and 145.50µm in Group C. The mean difference of diameter of white pulp between group A & B, group B & C and group C & A was statistically not significant at P> .05 level. From this study it was also observed that mean (±SD) diameter of white pulp was higher in male among the age groups but there was no significant difference between sexes. In statistical analysis, differences between age groups and sexes were calculated by using one way ANOVA test and unpaired't' test respectively.* ***Conclusion:*** *The diameter of white pulp increase with age upto certain level then decreases at the late age. There was no statistically significant difference in diameter of white pulp in between age groups and sex r.*

Keywords: Spleen, White pulp, Age, Sex, Bangladeshi cadaver.

Received: 24.01.2022, **Accepted:** 05.06.2022. ***Ad-din Sakina Women's Medical College Journal. 2022; 3 (2) :13-17***

Introduction

The spleen is a large haemolymphoid organ consisting of vascular and lymphoid tissue. It is located in the left quadrant of the abdominal cavity between the fundus of the stomach and the diaphragm, opposite the left ninth to eleventh ribs. It has friable texture due to its rich vascularity. The size of the spleen roughly corresponds to the cupped hand or fist of the subject. It has diaphragmatic and visceral surfaces, the superior and inferior borders and anterior and posterior ends or poles [1]. Splenic parenchyma consists of white and red pulp that is surrounded by serosa and a collagenous capsule with smooth muscle fibres. Trabecular dense connective tissue are rich in collagen and elastic fibres. These with the reticular framework, support the cells of the spleen and surround the vessels in the splenic pulp. Spleen is an elastic, controllable reservoir that is

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important in adjusting the volume of the circulating blood. In life the spleen undergoes both rhythmic and passive contractions. In part this activity is attributed to the smooth muscle in its framework [2,3]. During fetal development the spleen has important hematopoitic functions, which includes white and red blood cells production. Lymphocytes are formed in both types of pulp, but chiefly in the white pulp. The lymphatic tissue of the spleen is not arranged into cortex and medulla. It does have a distinctive pattern of blood circulation and specialized vascular channels that facilitate the filtering of blood [4]. It is also a major site of antibody synthesis. It is particularly important for defence against encapsulated bacteria and asplenic individuals are at risk of overwhelming Streptococcus pneumoniae and H. influenzae infection [5]. therefore, it is important to know the normal histology and variation of diameter of white pulp of the spleen. In this present study, diameter of white pulp of the spleen were studied and compared with the works of many eminent authors in this field.

Methods

The study was carried out in the department of Anatomy, Mymensingh Medical College, Mymensingh from June 2013 to July 2014. A total 30 human spleen were collected by purposive sampling technique from October 2013 to April 2014, among them 14 were male and 16 were female. The specimens were collected from Bangladeshi cadavers of age ranging from 6 months to 60 years, from autopsy laboratory of the Department of Forensic Medicine of Mymensingh Medical College and all the collected specimens of cadavers were from medico-legal cases (suicidal, homicidal and accidental death). Only fresh specimens from persons who died within the preceding 12 hours were chosen. Each specimen was duly tagged by a piece of waxed cloth which bore an identifying number representing individual serial number. Then the specimen was allowed to get fixed for 48-72 hours and preserved in 10% formol-saline solution. For convenience of differentiating the diameter of white pulp in relation to age and sex, the collected specimens were divided into three groups like Group A (upto 20 years), Group B (21 to 40 years) & Group C (41 to 60 years). Each group was again divided into male & female groups. Small pieces of tissue were taken from fresh 30 spleens which were fixed. For microscopic study, 10 slides from group A, 10 slides from group B and 10 slides from group C were collected. Size of the tissue block was 1cmsq and 4-5mm thick. Tissue samples were processed routinely by standard histological procedures, then sections were stained with heamatoxylin and eosin (H & E) stain and permanent slides were prepared. White pulp of the spleen is spherical which was somewhat difficult to measure the actual diameter. To overcome such type of drawback the numbers of ocular micrometer divisions were read out from near to remote margins of the white pulps and measurement were taken twice for each pulp one was maximum transverse diameter of pulp and another at perpendicular to the first one. Then the numbers of micrometer divisions were multiplied by the correlation factor derived earlier from keeping the magnification constant (x 10 objective, x 10 eyepiece). Therefore, the diameter of white pulps was calculated as follows: Diameter of white pulp = (Maximum transverse diameter + perpendicular diameter) ÷ 2 and the average value was taken from each slide and was expressed in µm. All data were recorded in the pre-designed data sheet, analyzed by SPSS program and compared with the findings of other national and international studies and standard text books.

Results

From Table I (a) it was evident that the maximum diameter of white pulp of spleen in Group A 566.40µm (0.56mm), in Group B 580.46µm (0.58mm) and Group C 590.63µm (0.590mm). The minimum diameter was 385.36µm (0.38mm) in Group A, 440.00µm (0.44mm) in Group B and 355.47µm (0.35mm) in Group C. It was also observed that the diameter of white pulp increased upto certain level then decreased in late age.

The mean (±SD) diameter of white pulp was 472.35±62.68µm in Group A, 461.93±42.71µm in Group B and 437.27±46.86µm in Group C. The mean diameter of white pulp was higher in Group A than Group B and C.

The mean diameter of white pulp was maximum in group A, 480.46µm in male and 464.23µm in female and minimum in group C, 442.17µm in male and 432.37µm in female.

The mean difference of diameter of white pulp between group A & B, group B & C and group C & A was statistically not significant at P> .05 level.

Table-I(a): Mean Diameter of White Pulp in Different Age Groups

Age Groups	Number of specimen	Diameter of white pulp (µm) Mean ± SD (Minimum – Maximum)
A (Upto 20 years)	10	447.35±62.68 (385.36-566.40)
B (21 – 40 years)	10	461.93±42.71 (440.20- 580.46)
C (41 to 60 years)	10	437.27±46.86 (355.47- 490.63)

Table-I(b): Comparison of Diameter of White Pulp among the Age Groups

Comparison between variables	Mean difference	Std. error	P	Level of significance
Group A vs Group B	10.421	23.986	0.669	NS
Group B vs Group C	24.657	20.05	0.235	NS
Group C vs Group A	35.078	24.748	0.173	NS

Table-II(a): Mean Diameter of White pulp in Different Sex Groups

Age Groups	Sex	Number of specimen	Mean± SD diameter of white pulp in µm
A (0-20 years)	Male	5	480.46±76.61
	Female	5	464.23±52.97
B (21 – 40 years)	Male	4	478.07±68.31
	Female	6	451.16±11.67
C (41to 60 years)	Male	5	442.17±49.53
	Female	5	432.37±49.27

Table-II(b): Comparison of Capsular Thickness of Spleen between Sexes

Age groups	Mean Difference between sex	t	P	Level of significance
A	7.574±5.186	1.46	0.182	NS
B	32.928±17.987	1.831	0.105	NS
C	11.41±5.128	2.226	0.057	NS

Table- II (a) and figure 1 depicts that the mean (±SD) diameter of white pulp was higher in male (480.46±76.61µm) in Group A, (478.07±68.31µm) in group B and (442.17±49.53µm) in Group C than that of female (464.23±52.97µm), (451.16±11.67µm) and (432.37±49.27µm) in Group A, B and C respectively. Variance analysis shows that there was no significant difference among the age groups at P> .05 level.

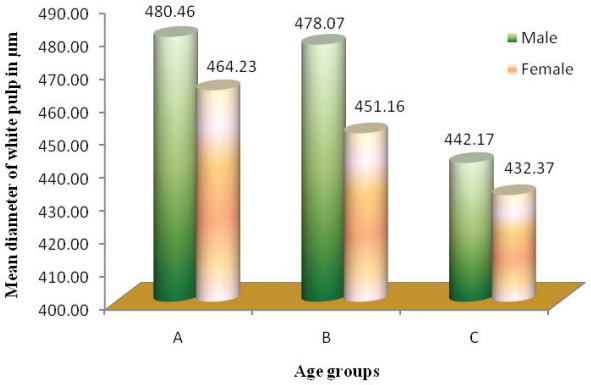
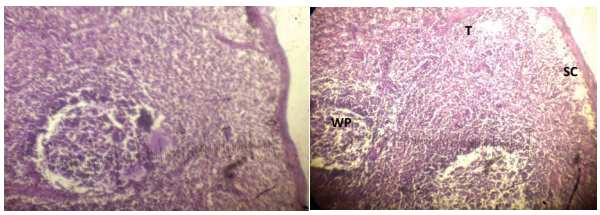


Figure 1: Bar diagram showing the mean diameter of white pulp in different age and sex groups.



Group A **Group B**

Figure 2: Photomicrograph of spleen showing diameter of White Pulp (WP), Red Pulp (RP), Splenic Capsule (SC), Trabeculae (T). H&E stain. X 10:

Discussion:

In this study 10 slides from each age group were chosen for measuring the diameter of white pulp and examined under low power objective (X10 objective, X10 eye piece). From the present study it was evident that, the maximum diameter of white pulp of spleen in Group A 566.40µm (0.56mm), in Group B 580.46µm (0.58mm) and in Group C 590.63µm (0.59mm). The minimum diameter was 385.36µm (0.38mm) in Group A, 440.00µm (0.44mm) in Group B and 355.47µm (0.35mm) in Group C. It was also observed that the diameter of white pulp increased upto certain level then decreased in late age.

The mean (±SD) diameter of white pulp was 472.35±62.68µm in Group A, 461.93±42.71µm in Group B and 437.27±46.86µm in Group C. The mean diameter of white pulp was higher in Group A than Group B and C. The mean diameter of white pulp was maximum in group A, 480.46µm in male and 464.23µm in female and minimum in group C, 442.17µm in male and 432.37µm in female. There was no significance difference in diameter of white pulp among the age groups.

In the present study the mean (±SD) diameter of white pulp was higher in male (480.46±76.61µm) in Group A, (478.07±68.31µm) in group B and (442.17±49.53µm) in Group C than that of female (464.23±52.97µm), (451.16±11.67µm) and (432.37±49.27µm) in Group A, B and C respectively.

Variance analysis shows that there was no significant difference between male and female among the age groups at P> .05 level.

Alim (2008) studied 30 spleens of Bangladeshi cadaver and found that the mean diameter of white pulp about 0.32±0.01mm [6]. The mean diameter of white pulp of present study was higher than Alim because most of the values were close to the lower limit. Young Barbara in 2006 found that macroscopically the spleen appears to consist of discrete 0.5-1 mm white nodules, called the white pulp [7], which supports the present study. Jacobsen C T and Shurin S B in 2003 stated that, the white pulp is grossly visible as the diameter of white nodules ranges from 0.1 to 0.2cm in diameter [8], the mean diameter of present study was lower than those of the above mentioned authors, because most of the values were close to the lower

limit. In 2002 Fawcett state that the cut surface of a hemisected spleen, reveals many rounded, gray areas 9.2-0.8 µm in diameter that collectively constitute the white pulp of the spleen [9].

Conclusion:

From the present study, it was concluded that the mean diameter of white pulp was maximum in group A, minimum in group C in both male and female. It was concluded from this study that the diameter of white pulp decreased with age and not significant difference in between Group A and C. There was no significant difference in between sexes.

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