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ORIGINAL ARTICLE

Comparison of Human Thymus Gland between Young and Old Age

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ABSTRACT

Aim: Study was conducted to examine the different parameters of human thymus glands of young and old patients and compare the findings between both age groups.
Study Design: Comparative/observational study
Place and Study: Study was conducted at Anatomy department of Nishtar Medical University Hospital, Multan for duration of six months from 15th January 2020 to 15th July 2020.
Methods: Total 54 specimens of human thymus of 54 patients were enrolled in this study. All specimens were divided in to two groups I and II, Group I contains 27 patients with ages ≤30 years and group II with 27 patients having ages 45 to 60 years. All specimens were fixed in 10% formalin solution and then processed for paraffin embedding. Compare the different parameters such as thickness of interlobular connective tissue and thymic capsule, length and number of Hassal's corpuscles between both groups. Data was analyzed by SPSS 24.0.
Results: In group I 12 (44.44%) patients were ages <15 years and 15 (55.56%) patients were ages >15 years. In group 13 (48.15%) and 14 (51.85%) patients were ages ≤50 years and >50 years. There was a significant difference observed between both groups regarding thickness of interlobular connective tissue and thymic capsule, quantity and length of Hassal's corpuscles with p-value <0.05.
Conclusion: It is to be concluded that patients with young age had significantly less thickness of thymic capsule and interlobular connective tissue with more in number and decreasing size of Hassal's corpuscles as compared to old age patients.
Keywords: Human Thymus Glands, Young Age, Old Age

INTRODUCTION

In the thymus, immunocompetent T cells with a broad repertoire of antigen-recognition are generated de novo. However, it is the organ that appears to shrink the most as we age. In vertebrates, this process, known as age-related thymic involution, is both evolutionary and conservatively preserved [1].

Its primary components are thymocytes of hematological origin and non-hematopoietic thymic epithelial cells (TECs). The thymic epithelial space is the major stromal niche responsible for supporting T-cell growth and maturation in the thymus. Adipocytes and peripheral lymphocytes gradually occupy the perivascular space as a result of age-related thymic involution, which begins in the first year of life and continues throughout adulthood at a rate of 3 percent per year [2-3]. In the aging thymus, the medulla and cortex lose their demarcation, and the corticomedullary junction becomes disorganized [4-6].

As the thymus ages, thymopoiesis declines, which precedes T-cell-related immune incompetence in the elderly. The onset of these changes has been reported to occur between the ages of 11-15 [7]. Thymic parenchyma shrinks with age, and most of it is replaced by fat by middle age, although functioning thymic tissue can still be present in the sixth decade of life [8].

Age-related accumulation of peripheral lymphocytes, followed by adipose tissue, was observed in the perivascular region of the thymus in an animal research [9]. As adipose tissue grows in the perivascular region, thymopoisis is reduced [10]. As the majority of thymus gland studies have been conducted on animals, the present study aimed to compare human thymus gland interlobe connective tissue thickness and the size and number of Hassal's corpuscles between young and old age patients.

MATERIALS AND METHODS

This comparative/observational study was conducted at Anatomy department of Nishtar Medical University Hospital, Multan for duration of six months from 15th January 2020 to 15th July 2020.A total 54 specimens of human thymus of 54 patients were enrolled in this study. All specimens were divided in to two groups I and II, Group I contains 27 patients with ages ≤30 years and group II with 27 patients having ages 45 to 60 years.

All specimens of thymus glands of both groups were fixed in 10% formalin solution and then processed for paraffin embedding. 5-micron thick sections were made on rotary microtome. These sections were then deparaffinized and stained using haematologin and easin (H&E) and periodic acid Schiff (PAS) stains. Micrometric measurement of parameters was done. Compare the different parameters such as thickness of interlobular connective tissue and thymic capsule, length and number of Hassal's corpuscles between both groups. All the data was analyzed by SPSS 24.0. Mean±SD was done. Chi-square test was applied to compare the findings between both groups with p-value <0.05 was taken as significant.

RESULTS

There were 16 (59.26%) male and 11 (40.74%) females in group I and in group II 15 (55.56%) male and 12 (44.44%)

female patients in group II. In group I 12 (44.44%) patients were ages ≤15 years and 15 (55.56%) patients were ages >15 years. In group II 13 (48.15%) and 14 (51.85%) patients were ages ≤50 years and >50 years. (Table 1, 2)

Table No 1: Demographics of group I patients

Characteristics	Frequency No.	%age
Gender		
Male	16	59.26
Female	11	40.74
Age		
≤15 years	12	44.44
16 to 25 years	15	55.56

Table No 2: Demographics of group II patients

Characteristics	Frequency No.	%age
Gender		
Male	15	55.56
Female	12	44.44
Age		
≤50 years	13	48.15
51 to 60 years	14	51.85

A significant difference was observed between both groups I and II regarding interlobular connective tissue and thymic capsules (26.85 ± 3.74 micron vs 49.94 ± 2.54 micron) and (168.76 ± 7.28 micron vs 229.66 ± 4.74 micron) with p-value <0.0001.

Table No 3: Comparison of thickness interlobular connective tissue and thymic capsule between both groups

Variables	Group I	Group II	P-value
Thickness of Interlobular connective tissue	26.85 ± 3.74	49.94 ± 2.54	<0.0001
Thickness of Thymic Capsule	168.76 ± 7.28	229.66 ± 4.74	<0.0001

In group I a significant difference was observed between both groups I and II regarding size and number of Hassal's corpuscles (106.44 ± 6.48 micron vs 156.28±5.37 micron) and (2.01 ± 0.78 vs 0.98 ± 0.16) with p-value <0.0001.

Table No 4: Comparison of size and number of Hassal's corpuscles between both groups

Variables	Group I	Group II	P-value
Size of Hassal's Corpuscles	106.44 ± 6.48	156.28±5.37	<0.0001
Number of Hassal's Corpuscles	2.01	0.98 ± 0.16	<0.0001

DISCUSSION

In present study there 16 (59.26%) male and 11 (40.74%) females in group I and in group II 15 (55.56%) male and 12 (44.44%) female patients in group II. In group I 12 (44.44%) patients were ages ≤15 years and 15 (55.56%) patients were ages >15 years. In group II 13 (48.15%) and 14 (51.85%) patients were ages ≤50 years and >50 years. We divided all 57 specimens of thymus glands in two groups. Group I contains 27 patients with ages ≤30 years and group II with 27 patients having ages 45 to 60 years. We found that the color of thymus gland in group I was changed to the color of group II. These results were similar to the some previous studies in which the color of tissues were pale, gray in young age and it changed to yellowish brown in old age [11-12].

In this study significant difference was observed between both groups I and II regarding interlobular connective tissue and thymic capsules (26.85 ± 3.74 micron vs 49.94 ± 2.54 micron) and (168.76 ± 7.28 micron vs 229.66 ± 4.74 micron) with p-value <0.0001. We found that thickness of thymic capsule was significantly less in young patients while among old patients it was increasing. A study conducted by Heshmat SW Haroun [13] reported that thymic involution with aging results in less efficient T-cell development and decreased emigration of naïve T cells to the periphery. Igbokwe CO et al [14] reported that the size of thymic capsule was increasing with advancing age with p-value <0.05.

In present study, we found a significant difference both groups I and II regarding size and number of Hassal's corpuscles (106.44 ± 6.48 micron vs 156.28±5.37 micron) and (2.01 ± 0.78 vs 0.98 ± 0.16) with p-value <0.0001.Patients with young age had decreasing size of Hassal's corpuscles but increasing number while patients with old age had increasing with size but decreasing Hassal's corpuscles. These results were comparable to many of previous studies in which Hassals corpuscles in young age were decreasing in number but maximal in size [15-16]. Hassel observed a rise at first, followed by a decline in later life [17]. With age, the quantity of Hassal's corpuscles in rat thymus decreases, according to Majeed and colleagues [18]. Hassal's corpuscles also had a statistically significant variation in diameter between two groups, which grew with age. [19] This study confirms the findings of a previous one. According to research [20], TSLP is expressed on the surface of the epithelial cells that line Hassal's corpuscles, and this chemical signal leads dendritic cells to convert poor T-cells that have escaped thymic censorship into good regulatory T-cells.

CONCLUSION

We concluded that patients with young age had significantly decreasing thickness of thymic capsule and interlobular connective tissue and increasing with old age. When Hassal's corpuscles were young, they grew in number and grew smaller, whereas when they were older, they grew in size and grew smaller. There was a substantial difference between young and old patients in terms of these thymus glands' characteristics.

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