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Morphofunctional Changes of the Spleen Under the Influence of Various Factors in Postnatal Ontogenesis

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ABSTRACT

The effectiveness of protective reactions of the body against the influence of external factors largely depends on the morphofunctional state of the peripheral organs of immunogenesis, in particular the spleen.As a result of the influence of external factors, there is a decrease in the density of cells in the lymphoid structures of the white pulp of the spleen and its comparative size in relation to red pulp, in which the composition of the cells changes little.

Introduction

Spleen is a capsulated and compartmentalized lymphoid organ with a complex vascular and cellular organization. It develops from dorsal mesogastrium. The spleen performs a number of physiological functions namely, phagocytosis of aging erythrocytes and platelets, recycling iron, inducing immune response against blood antigens, and defending against invading bacteria, fungi, viruses, prions and otherinfective agents. Because thespleen has only the efferent lymphatic vessels, it is therefore, involved in the filtration of blood but not lymph. The splenic functions can be affected by immune suppressant drugs, vaccines and biological products, chemo- and radiation-therapy, resulting in splenomegaly and thrombocytopenia (reduced number of platelets). Recently, it has been shown that the splenic monocytes play a significant role in the regeneration of heart tissue following a heart attack. Different factors affect splenic morphology:

Species: There are a number of species differences in the gross and histologic appearance of the spleen. In dogs, for example, the spleen is somewhat dumbbell shaped, while in mice and rats, it's more uniform along the longitudinal axis. The spleen in dogs is able to expand to store large numbers of erythrocytes, but it is also capable of rapid contraction. Therefore, its gross appearance is quite variable, ranging from large and dark red to blue-black to smaller and lighter red. The capsule and trabeculae of dogs contains more smooth muscle than that of mice and rats, so the spleens of rodents do not contract as rapidly and tend to vary less in their gross appearance (Valli etal.,2002). The

splenic artery also differs among species. In dogs, it branches into as many as 25 smaller branches prior to entry into the spleen (Hogan Eschand Hahn, 2001), while in the rat, there are as many as eight branches (Satodate et al., 1986). Vascular arrangements are perhaps the greatest source of species variation in splenic architecture. Species variation in the structure and morphology of the venous sinuses forms the basis for the classification of spleens into two groups, sinusal spleens and nonsinusal spleens (Schmidt etal.,1985a). Sinusal spleens are found in rats and dogs and nonsinusal spleens are found in mice (Schmidt et al., 1985a). The venous sinuses of sinusal spleens are larger, more abundant, make numerous anastamoses, and have a characteristic wall structure relative to the venous sinuses of nonsinusal spleens (for an in depth description of these differences, see Snook (1950) and for more detail on the wall structure of each vessel type, see Blue and Weiss (1981) (Schmidt et al., 1985a). The venous sinuses of nonsinusal spleens are so different, in fact, that some investigators use the term pulp venules rather than venus sinuses(Schmidt etal.,1985a).The larger venous sinuses of the rat spleen are far more conspicuous than those of the mouse spleen. There are also species differences in the arterial vasculature. Schmidt et al. have reported that, in dogs, the arterial capillaries both terminate in the reticular meshwork (open circulation) and empty directly into the venous sinuses with no interruption of the endothelial lining (closed circulation) (Schmidt et al., 1982, 1983, 1993). In dogs, but not rats, the arterial capillaries are surrounded by dense, circumferential clusters of macrophages known as ellipsoids or periarterial macrophages heaths (PAMS) (BlueandWeiss,1981; Satodate et al., 1986). In dogs, there are very few capillaries within the PALS, as opposed to rats and mice where the PALS have abundant capillaries (Schmidt etal.,1983,1985a, 1985b, 1993). Extra medullary hematopoiesis is more prevalent in spleens of mice than rats. In dogs, hematopoietic tissue is present in the spleen in pathologic conditions such as neoplasia and anemia, but may be present in the absence of underlying disease (HoganEsch and Hahn, 2001). When the hematopoietic tissue is predominantly myeloid, the term myeloid hyperplasia may be applied. The incidence of splenic myeloid hyperplasia in the absence of underlying disease was 4%in beagledogsinone study(HoganEschandHahn,2001). Though there is a lot of individual variation, mice tend to have a greater proportion of white pulp than rats, but the follicles and marginal zone of miceareless distinct than those of rats (Figures 1, 2, and 7) (Ward et al., 1999). In rats, the marginal zone comprises up to 28% of the splenic volume and is the largest B-cell region in the spleen (Dijkstra and Veerman, 1990; Schmidt et al., 1993). Approximately onethird of the B-cells in the rat spleen have the marginal zone B-cell phenotype, whereas in the mouse, only 15% of the splenic B-cells have this phenotype (Van Rees et al., 1996). Though the region where the marginal sinusis locate dismore consistently discernible in rats, electron microscopic studies show that the marginal sinus is up to 6 times larger in mice (Schmidt et al., 1993).

Age: In the fetus, the spleen begins as a collection of primitive reticular cells in the dorsal mesogastrium. The first cells to appear are hematopoietic, which are evident by gestation day 17 in the rat (Losco, 1992). In the mouse, splenic tissue can first be identified, light microscopically, at gestation day 12.5 and the first hematopoietic cells can be seen at gestation day 15.5 (Seymour et al., 2006). In the dog, lymphocytes first appear in the spleen at gestation day 52, while the rodent spleen contains little or no white pulp at birth (HoganEsch and Hahn, 2001; Van Rees et al., 1996). The first lymphocytes to appear are T-cells that accumulate in the PALS regions (Losco, 1992; Van Rees et al., 1996). In rats, this begins by 2 days of age, by day 5, dendritic cell precursors appear, after which B-cell follicles begin to develop, and immunologic function begins at 14 days of age when cell to cell contact of antigen presenting endritic cells becomes apparent (Losco, 1992). The spleen reaches peak

development at puberty, in rats, followed by gradual involution (Losco, 1992). In dogs, the spleen increases in weight during the first 6months of life(HoganEschandHahn,2001). Numerous references discuss the effects of aging on lymphocyte function and changes in the distribution of lymphocyte subsets. Lymphocyte numbers, however, may also decrease with age. One study showed a greater than 80% decrease in lymphocyte numbers in the white pulp of Fisher rats between 4 and 30 months of age (Cheung and Nadakavukaren, 1983). This change corresponded, light and electron microscopically, to a decrease in lymphocyte density in the white pulp (Cheung and Nadakavukaren, 1983). There was also an increase in the number of reticular cells and macrophages in the same regions (Cheung and Nadakavukaren,1983).Some degree of white pulpa trophyis also a common aging changein Sprague–Dawleyrats(Losco, 1992). The spleens of older dogs and rodents typically have fewer germinal centers (HoganEsch and Hahn, 2001; Losco, 1992). Extra medullary hematopoiesis tends to be decreased in adult animals, but can increase in any animal when there is increased demand for these cells as in cases of anemia, inflammation, decreased production by the bone marrow, or in casesofneoplasia(Losco,1992).The amount of hemosiderin present in the spleen tends to increase with age in both rodents and dogs (HoganEsch and Hahn, 2001; Losco, 1992; Van Rees et al., 1996) and, in mice, is more prevalent in females than males (Ward et al., 1999). Genetics: Genetic mutations in rats and mice, either spontaneous or engineered, resulting in immunodeficiency markedly affect the morphology of the spleen. Among the immune deficient strains, nuderatsand SCID(severecombined immunodeficiency disease) mice are perhaps the best known and most commonly used in scientific studies. Nude rats are congenitally athymic and so are deficient in T-lymphocytes. The spleens of nude rats (and mice) are smaller than those of their wild-type counterparts. They have sparsely populated PALS regions and, since T-cell activity is required for the formation of germinal centers, lack secondary follicles (Figures 11 and 12) (Bell et al., 1987; Hanes, 2005). SCID mice are homozygous for the Prkdcscid mutation, a mutation in the gene encoding the catalytic subunit of DNAdependent protein kinase (DNA-PKcs) (Perryman, 2004; Seymour et al., 2006). This results in a defect in V(D)J recombination of T-cell receptors and B-cell immunoglobulin receptors and a lack mature B- and T-cells (Perryman, 2004). The spleens of SCID mice are smaller than those of wild-type mice and all three regions of the white pulp contain few lymphocytes but do contain macrophages (Custer etal.,1985).The follicles are variable in size and contain occasional plasma cells, however, follicular dendritic cells are absent since Band Tcells arere quired for the developmentof these cells (Custer et al., 1985; Seymour et al., 2006). The marginal zone is markedly decreased in size and is poorly demarcated from the PALS and follicles (Figure 13). In both the SCID and nude mutants, the reticular framework of the sparsely populated white pulp is intact (Custer et al., 1985; Hanes, 2005).

The effectiveness of protective reactions of the body against the influence of external factors largely depends on the morphofunctional state of the peripheral organs of immunogenesis, in particular the spleen [Kochmar M.Yu. hammual. 2010; Cesta M. F., 2006; Melanie S. et al. 2008].

As a result of the influence of external factors, there is a decrease in the density of cells in the lymphoid structures of the white pulp of the spleen and its comparative size in relation to the red pulp, in which the composition of the cells changes little [Chava, S.V., 2011; Evlahova, L.A., 2013].

Long-term exposure of the antigen leads to an increase in proliferative processes in the white pulp [Buccleuch yu.V., Vovkogon A.D., 2018].

A significant increase in macrophagal-proliferative and destructive processes in the functionally active areas of the rat spleen indicates the negative effects of emotional loading [Bakhmet A.A.,

2014].

In many literature, laboratory animals are found in immune organs (thymus, spleen, lymph nodes, Peyer's PIL), an anti-rabies vaccine [cousin A. V. and hammual. 2004], the drug" Immunovak VP-4 " [Lebedinskaya o. V. and hammual. 2011], Immunomodulators [Razumov A. N. and hammual. 2010] when applied, long-term consumption of silicon with drinking water [Gordova V.S. and hammual. 2013] the morphological and functional changes that occur are described in detail.

Under the influence of carcinogen, there is an outbreak of several processes in the body, immune organs, leading to certain changes [Mikhailova M.N. and hammual. 2011].

The spleen plays an important role in the formation of immune defenses against tumors. The introduction of 1,2-dimethylhydrazine into the body leads to significant morphological and immunogystochemical changes in the white pulp of the spleen. The amount of small diameter lymphatic nodules increases compared to other nodules of different diameters. The diameter of the lymphatic nodules and their reproductive centers decreases. 4 months after the end of carcinogenic uptake, more clearly expressed hypoplasia of lymphoid nodules is recorded compared to the previous period. Lymphatic nodules have a significant reduction in the diameter of the Centers of reproduction and the width of the border area. Palm decreases in diameter, the number of V - and T - lymphocytes decreases [Merkulova L.M. and hammual. 2016].

In hypostatic pneumonia against the background of chronic heart failure, there is a decrease in the relative volume of the white pulp of the spleen, and an increase in the red pulp. Cell location density also decreases, but cell composition changes little [Klimenko N. A. and hammual. 2009].

In chronic immune inflammation, proliferative processes occur in the white pulp of the spleen. The volume of white pulp, the density of cell elements in lymphatic nodules and periarterial lymphatic mucosa increases. Apoptosis and macrophagal reaction increase in spleen lymphoid structures [Klimenko N.A. and hammual. 2009].

When a person stimulates the body with normative immunoglobulin once, within a month, a change in the density of lymphocytes, plasmocytes, macrophages cells occurs in the white pulp of the spleen of white male rats under puberty. These indicators increase highly on the 7th day after antigen exposure. Lymphatic nodules the density of small lymphocytes in the border area maximizes on the 30th day after the introduction of the antigen [Gerbut A.O., 2007; Mark F. Cesta., 2006]. On the 2nd day after Antigen stimulation, the number of fat cells increases sharply at first, then gradually decreases, and by the 30th it equates to normative indicators [Golovasky A. S. and hammual. 2008; Kasay V.V., Shepitko V.I., 2008].

References:

1. Агеев Ф. Т. Нужно ли слепо следовать рекомендациям по лечению сердечной недостаточности, основанным на результатах международных клинических исследований? Значение исследования SENIORS для российской популяции больных ХСН // Сердечная недостаточность. - 2006. - Т. 6, № 6. - С. 258-262.
2. Андрусев А.М., Томилина Н.А., Перегудова Н.Г., Шинкарев М.Б. Заместительная терапия терминальной хронической почечной недостаточности в Российской Федерации 2014–2018 гг. Отчет по данным Общероссийского Регистра заместительной почечной терапии Российского диализного общества [Интернет]. Российское диализное общество. Регистр 2018. Доступно на: http://nephro.ru/index.php?r=site/page View&id=298%20,%20journal.nephro.ru/index.php?r=journal/pageView&id=298.

3. Атрощенко Е. С. Пациент с хронической сердечной недостаточностью и сохраненной систолической функцией левого желудочка // Сердечная недостаточность. - 2007. - Т. 8, № 6. - С. 297-300.

4. Беленков Ю.Н., Привалова Е.В., Данилогорская Ю.А. [и др.] Влияние терапии β-блокаторами на клинико- гемодинамические показатели, маркеры воспаления и уровень фактора Виллебранда у больных с хронической сердечной недостаточностью // Кардиология и сердечно- сосудистая хирургия. – 2009. – Т. 2, №6. – С. 58–64.

5. Васюк Ю.А., Дударенко О.П., Ющук Е.Н. [и др.] "Цитокиновая" модель патогенеза хронической сердечной недостаточности и возможности нового терапевтического подхода в лечении декомпенсированных больных // Рациональная фармакотерапия в кардиологии. – 2006. – Т. 2, № 4. – С. 63–70.

6. Вельков В.В. современная лабораторная диагностика ренальных патологий: от ранних стадий до острой почечной недостаточности// вестник лаборатории ДНК-диагностики-2011№1(10)-С.6-11

7. Веснина Ж. В., Арсеньева Ю. А. Кардиоренальный синдром: современные взгляды на проблему взаимосвязи заболеваний почек и сердечно-сосудистой системы. // Клиническая медицина, № 7. – 2012. – С. 8-13.

8. Жумаев М. Ф. ХАРАКТЕРИСТИКА И НЕДОСТАТКИ иКЛИНИЧЕСКОЙ И МЕДИЦИНСКОЙ ДИАГНОСТИКИ ТУБЕРКУЛЕЗА ЛЕГКИХ //BARQARORLIK VA YETAKCHI TADQIQOTLAR ONLAYN ILMIY JURNALI. – 2022. – Т. 2. – №. 10. – С. 367-372.

9. Jumayev M. INFLUENCE OF DIABETES MELLITUS COURSE AND RESULTS OF TUBERCULOSIS TREATMENT. – 2022.

10. Aslonov F. I., Rustamova S. A., Raxmonova K. M. Immunopatological aspects in patients with first detected pulmonary tuberculosis //World Bulletin of Public Health. – 2021. – Т. 4. – С. 91-95.

11. Ismoilovich A. F. Tuberculosis Diagnostics with Modern Solutions (Literature Review) //CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES. – 2022. – Т. 3. – №. 3. – С. 377-383.

12. Rakhmonova K. TUBERCULOSIS AND IRON-CONTAINING CHEMOTHERAPEUTIC DRUGS. – 2022.\

13. Mizrobovna R. K. Accompanying Diseases of the Respiratory System Pulmonary Tuberculosis //European Multidisciplinary Journal of Modern Science. – 2022. – Т. 4. – С. 244-250.

14. Алимова Г. С. Массовый Скрининг Для Выявления Туберкулезной Инфекции У Детей В Возрасте От 2 До 8 Лет //CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES. – 2022. – Т. 3. – №. 3. – С. 368-376.

15. Salimovna A. G. Diagnosis of Tuberculosis Infection Activity by ELISA and Transcription Analysis Methods //European Multidisciplinary Journal of Modern Science. – 2022. – T. 4. – C. 492-497.

16. Ulugbek o'gli A. M. Test for Procalcitonin as a Way to Predict Patients with Respiratory Tuberculosis //European Multidisciplinary Journal of Modern Science. – 2022. – T. 4. – C. 486-491.

17. Usmonov I., Shukurov U. Features of the Clinical Course, the State of Diagnosis and Treatment of Hiv-Associated Pulmonary Tuberculosis in Modern Conditions Literature Review //Annals of the Romanian Society for Cell Biology. – 2021. – C. 1809-1828.

18. Erkinova, N. (2021). OBSERVATION OF ALBUMINURIA IN CHRONIC HEART FAILURE AND SOME OF ITS CLINICAL FEATURES. Galaxy International Interdisciplinary Research Journal, 9(05), 442-446.

19. Ulugbek o'gli A. M. Factors Predicting Mortality in Pulmonary Tuberculosis //CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES. – 2022. – T. 3. – №. 3. – C. 362-367.