Study of histopathological changes in brian of mice infected with Toxoplasma gondii isolated from domestic rabbit

Raghad Ibraheem Khalil Al-Mahdawi¹, Alia Yousif Yakoob¹ and Rajha abd Alsattar²

¹Department of Parasitology, ²Department of pathology, College of Veterinary, Baghdad University, Iraq.

E-mail: raghan.ibraheem@yahoo.com
Accepted: 23/12/2014

Summary

The study was designed to determine the infection rate of Toxoplasma gondii in the rabbits and histopathological changes of infected internal organs in mice. A total of 60 blood samples were collected from clinically healthy rabbits from different region of Baghdad city for the serological detection of T. gondii infection. Biological assay in mice was performed by intraperitoneal inoculation of 0.1 ml digested organs suspension, (lungs, heart, liver, spleen, kidney, muscles, and brain) during the period from October 2013 until July 2014. The results revealed histopathological changes in bioassay mice infected by T. gondii isolated from domestic rabbit, no histopathological changes in the brain of animals of first group1 (control group), but in the group 2 (killed at day 15) the main pathological changes were perivascular perineuronal edema with presence of some degenerated neurons characterized by shrunken dark blue stained (basophilic) cell bodies. In the animals of the group 2 (killed at day 21) the main brain histopathological changes were Sever congestion of meningeal blood vessels with infiltration of inflammatory cells and focal aggregation of microglial cells with diffuse obvious focal gliosis, whereas, in the same group animals that killed at day 28 the main brain histopathological changes were focal encephalomalacia and edema between molecular and granular layer.

Keyword: Brain histopathological, Mice, Toxoplasma gondii, Rabbits.

Introduction

Toxoplasma gondii is a common and significant obligate intracellular pathogen of humans and animals, it is a highly prevalent, intracellular protozoan parasite with indirect life cycles (1). It infects a very broad spectrum of warm- blooded vertebrates, including humans, as intermediate host, but can reproduce sexually only in the feline intestine (2). In the a sexual cycle, the two developmental stages are the rapidly multiplying tachyzoites and into the slowly multiply, causing the cell to rupture and release organisms locally and into the blood stream (3 and 4). As the host develops immunity, the parasite retains its overall size and shape, but transforms into the bradyzoite stage and multiplies more slowly within tissue-cysts establish a persistent infection (5). These microscopic tissue cysts are present most frequently in the brain and skeletal muscle and represent the inactive stage of the parasite within the host. Viable tissue cysts within the muscle (meat) are a significant source of human infection. In animals that submit to acute infection tachyzoite may be demonstrated in ascetic fluid or in lung impression smears as well as in tissue section of the liver and other affected organs (6). Due to poor acknowledgment about the Toxoplasmosis in rabbit (7 - 9). There the present study designed to demonstrate the histopathological changes in bioassay mice infected by toxoplasma isolated from domestic rabbit.

Materials and Methods

Sixty domestic rabbits (30 male, 30 female) aged between 5 to 8 weeks and weighing between 1500 and 2000 gm were collected from different parts of Baghdad and examined for detection and isolation of toxoplasmosis by pepsin digestion methods. Pepsin digestion method: pepsin digestion performed according to Dubey and Beatti (10) briefly by blending of different organs (5 gm of each liver, spleen, kidneys, lungs, heart, and skeletal muscles) with 5 volumes of normal saline until homogeneous, then to each 30 ml of homogenate 25 ml of digestion fluid were added (pepsin 2.6 g; NaCl, 5.0 g; HCl, 7.0 ml; and distilled water to make 500 ml of solution). The homogenates were incubated at
37°C for 90 min in a shaker, then filtered through gauze and centrifuged at 3,000 rpm./min for 10 min. The supernatants were poured off while sediments resuspended in 5 ml of normal saline containing 1000IU penicillin and 100 mg streptomycin per 1ml. Mice bioassay: Twenty mice of both genders with an age range (4 – 6) weeks, adopted at the animal house of College of Veterinary Medicine, Baghdad University, for 2 weeks before starting the experiment by rearing in separated, clean, disinfected cages, they were fed on commercial assorted pellet. They were divided into 2 groups, the first group (as a control group) had 5 mice injected intraperitonally with PBS and were left for 28 days while the animals of group 2 had 15 mice were injected I/P with 0.1 suspensions of digested organs solution at zero day and euthanized and dissected at 15, 21, and 28, days respectively. After 0,15,21,28 days post inoculation, randomly selected five mice were sacrificed by chloroform and postmortem examination were done for histopathological examination (11).

**Results and Discussion**

The results revealed no histopathological changes in the brains of mice on the first group1 (control group), but in the group 2 (killed at day 15) the main pathological changes were perivascular perineuronal edema with presence of some degenerated neurons characterized by shrunken dark blue stained (basophilic) cell bodies (Fig. 1 and 2). In the animals of the group 2 (killed at day 21) the main brain histopathological changes were Sever congestion of meningeal blood vessels with infiltration of inflammatory cells and focal aggregation of microglial cells with diffuse obvious focal gliosis (Fig. 3 and 4), whereas, in the same group animals that killed at day 28 the main brain histopathological changes were focal encephalomalacia and edema between molecular and granular layer. With degeneration of Purkinje cells in addition to complete dissolution of the other (Fig. 5 and 6). The present histopathological finding reveals different pathological lesions in internal visceral organs, increasing its severity with time experiment. The main brain lesion at 15 days was congestion of brain, cerebellum and meningeal blood vessels with different microglial aggregation (microglia).

At 21days this result agrees with (12). To refer to acute infection with *T. gondii* induce dendritic cell migration, and when infected dendritic cells are introduced to mice, the
pathogen disseminates more rapidly than with parasite alone, including across the blood-brain barrier (13). While advance lesion characteristic by developed to multiple encephalitis this investigation confirms the results of (14) who explained that chronic toxoplasma infection lesion occur more often in muscle, eye and brain than in visceral tissue, also (15) recorded that the pathological lesion associated with chronic *Toxoplasma* in brain, include congestion of blood vessels in the meninges with numerous mononuclear cell infiltration in the meninges and around the blood vessels. However, variable sized areas of encephalomalacia were recorded at 28 day post infection this may indicate that chronic infection may result in a local degenerative cell loss. Parasites within neurons could directly cause the death of infected neurons or atrophy of their processes and inflammation may contribute, via the production of nitric oxide and other toxic oxygen products, to the death of neighboring neurons (16).

References

دراسة التغيرات النسيجية لدماغ الفئران المصابة بطفل التوكسوبلازما المعزولة من الآرابن

رغد إبراهيم خليل المهداوي 1 و عالية يوسف يعقوب 1 و راجحة عبد الستار النعيمي 2

1 فرع الطفيليات، 2 فرع الأمراض و أمراض الدواجن، كلية الطب البيطري، جامعة بغداد، العراق.

E-mail: raghad.ibraheam@yahoo.com

الخلاصة

استهدفت الدراسة الحالية تحديد نسبة الإصابة بداء المقوسات الكوندية في الآرابن، ودراسة التغيرات النسيجية الاعضاء المصابة في الفئران، لتحقيق هذين الهدفين تم جمع 60 نموذج دم من آرابن سليمة سريريا من مناطق متنوعة من مدينة بغداد للتعرف على الإصابة بداء المقوسات الكوندية وتحديد حال الفئران، تم إجراء تحليل عقني في الفئران بعد اجراء المادة محلية في الدم، والدماغ، والعضلات، والقلب، وكمية التقرير في تحليل الفئران وناتجية عن بين الشريان من تشريح الأول 2014. وظهرت النتائج عدد ووجه تغيرات نسيجية مرضية في الدماغ مجموعة البسطة، بينما اظهرت ونها حول الأوعية الدموية وحول الاعضاء مع وجود بعض الأعراض المتنكسة تميزتها الاصناف النسيجية الخلوية وثاتها بلون ازرق داكن في الدماغ المقطوعة في يوم 15 من الحقن، أما الفئران المقطوعة في يوم 21 من الحقن فقد كانت التغيرات النسيجية الرئيسية في الدماغ عبرة عن احتقان شديد في الأوعية الدموية للسحالي مع ارتفاع للخلايا الالتهابية وتجميع أضعاف للخلايا الدبقية الدقيقة وتتدريب موضعي واضح بين تغيرات النسيجية في الدماغ المقطوعة في يوم 28 بعد الحقن بودمة بين الظاهرة الحببية والطبقة الجزيئية.

الكلمات المفتاحية: تغيرات نسيجية لدماغ الفئران، طفيلي التوكسوبلازما، الآرابن