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PARASITIC WORMS IN SURPRISING PLACES: CLINICAL AND MORPHOLOGICAL FEATURES

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Parasitic worms, often referred to as helminthes, are a division of parasites (parasitic organisms). They are worm-like organisms living in and feeding on living hosts, receiving nourishment and protection while disrupting their hosts' nutrient absorption, causing weakness and disease. Helminthes often find their way into a host through contaminated food or water, soil, mosquito bites and even sexual acts. Poorly washed vegetables eaten raw may contain eggs of nematodes such as Ascaris, Enterobius, Thichuris, and/or cestodes such as Taenia, Hymenolepis and Echinococcus. Plants may also be contaminated with fluke metacercaria (e.g. Fasciola). Undercooked meats may transmit Taenia (pork, beef and venison), Trichinella (pork and bear), Diphyllobothrium (fish), Clonorchis (fish) and Paragonimus (crustaceans). Schistosomes and nematodes such as hookworms (Ancylostoma and Necator) and Strongyloides can penetrate the skin. Finally, Wuchereria, Onchocerca, and Dracunculus are transmitted by mosquitoes and flies [1].

So, there are several ways for the parasites to enter the body: nutritional (through contaminated food, water, dirty hands), contact-household (through household items, from infected family members, pets), transmissive (by blood-sucking insects), and percutaneous, or active (in which the larvae penetrate the skin or mucous membranes during contact with contaminated soil, while swimming in open water) [2].

There are more than 300 species of helminthes parasites registered in humans. They occur in all countries of the world. There are about 25–30 species of helminthes pathogenic for humans in Ukraine [3, 4].

These diseases have certain territorial and social features of the dissemination, but due to the increasing process of migration in recent years, they have been encountered everywhere. There is a trend to increased infestation of enterobiasis, lambliosis, toxocariasis, opistorchosis, diphyllobothriasis, tenidosis, echinococcosis. The risk of importation of parasitic infestations which are not peculiar for Ukraine is increasing. Among them are widespread in South-East Asia, Africa and Latin America – schistosomiasis and filariasis [2, 4].

Helminthes in the processes of their life cause mechanical damage to the organs and tissues of the body, they are the triggers for many chronic diseases, they lead to vitamin deficiencies, depletion of microelements, infringement of hematopoiesis and the work of nervous and endocrine systems, violation of vascular permeability and anticancer defenses of the body. In response to parasitic invasions, people develop allergic reactions and the force of immunological reactions is changed, by the suppression of the immune response of the host organism, thus, the conditions for further development of allergic disorders are created [2, 4].

The most frequent place for localization of helminthes in the body is the gastrointestinal tract, however, parasitic worms may dwell in any part of the human body: in the vital organs (brain, heart, lung, liver and kidney), in the muscles, under the skin, etc.

In this article we discuss a few typical and atypical localizations for parasites recovered from patients of Kharkiv region, Ukraine and describe them based on their structure and localization in the tissue samples.

Case 1. A 59 year old woman presented to the surgical department of Pervomaysk Central District Hospital with complaints of a nodule in the anterior abdominal wall that appeared 5 months ago and grew rapidly over this time. She had no history of travelling within the last 5 years. The clinical diagnosis was neurinoma of the anterior abdominal wall. The mass was excised and sent to the pathology department of the Kharkiv Regional Clinical Hospital.

Macroscopically, a fragment of the skin with underlying fatty tissue (size − 3.5×1.4 cm). In the cross-section of the fatty tissue, a round-oval formation with clear boundaries (0.6 cm in diameter) and whitish-gray color was observed.

Microscopically in the fatty tissue, the body of the parasite with the formation of a ch

ronic abscess around it was observed (fig. 1). The parasite was identified as a filarial worm of Onchocerca species (fig. 2).

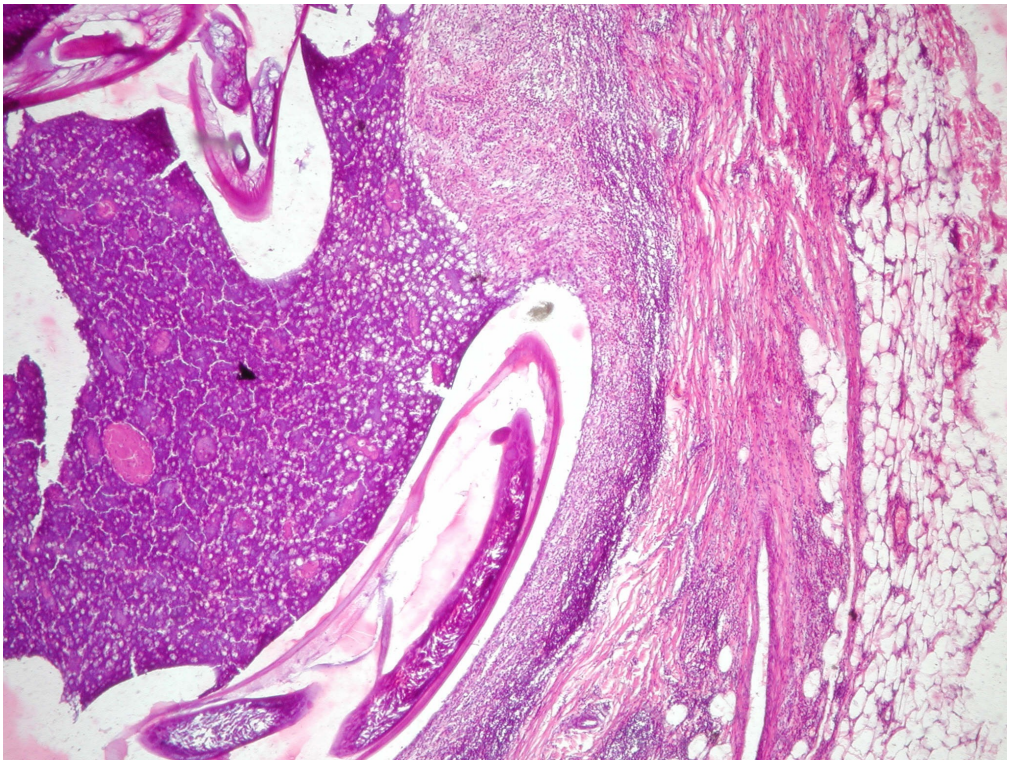


Fig. 1. Fragments of the parasite in the chronic abscess cavity. Stained with haematoxylin and eosin, ×40.

Fig. 2. The parasites which were identified as a filarial worm of Onchocerca species. Stained with haematoxylin and eosin, ×100.

It's known, that Filariae of animals, especially those of mammals, often infect humans and typically produce cryptic infections. These «zoonotic» infections have been reported from virtually all parts of the world including

temperate zones. Infections may be symptomatic or not, and the parasites are found in surgical tissue biopsy specimens or, more rarely, are removed intact from superficial sites such as the orbit or conjunctivae. Typically, these worms tend to occupy tissue sites similar to those occupied in the natural animal host, with the exception of the eyes. Many kinds of filariae have been isolated from humans, including species of Dirofilaria, Brugia, Onchocerca, Dipetalonema, Loaina and Meningonema. Worms have been found in subcutaneous tissues, heart and lungs, lymphatic nodes, eyes and central nervous system. Specific identification of these filariae is based on their morphological features in histologic sections. Unfortunately, some of these worms cannot be identified even at the generic level. There are other species of filariae, presumed to be zoonotic, which produce patent infections in humans but are poorly and incompletely known.

All of the filariae utilize bloodsucking insects as biological vectors, so that humans are infected by zooanthropophilic species which fed previously, in an appropriate time frame, on an animal with a patent filaria infection [5].

The infective larvae of these filariae invade a variety of human tissues and elicit little or no discernible response from the host during the course of their development unless they enter exquisitely sensitive tissues such as the conjunctivae. However, when these parasites die in the tissues, the host mounts a foreign body response to their presence. It is unclear in these cases whether the parasite becomes moribund and the host responds to the dying worm or whether the host ultimately mounts a response which kills the worm. Inasmuch as most of these infections persist for months without a detectable host response, it seems likely that at some level, the worm finds itself in an unnatural host and succumbs and that this is followed by a tissue reaction to the dying worm. This argument is further strengthened by the observation that in their natural hosts, filariae are typically long-lived, living often several years or more. Zoonotic infections are typically cryptic; i.e., only in rare instances are circulating microfilariae found [6–8].

Because the parasites are found most frequently in sections of tissue, their identification depends on the knowledge of the micromorphologic features of the individual parasite species. Often, many of these filariae can be accurately identified at the generic level from the morphology of the body wall. It is possible to determine the sexual maturity and reproductive state of female worms by examination of the contents of the reproductive tubes, especially the ovaries, seminal receptacles, and uterine branches either in the intact worms or in transverse sections [9]. Some parasites are well described and characterized, while others are not. Consequently, species identifications are often difficult if not impossible.

Onchocerca species. Members of the genus Onchocerca have caused zoonotic infections on rare occasions. Many species of Onchocerca are natural parasites of animals, particularly bovines and equines worldwide, and one species (Onchocerca volvulus) infects humans in Africa and Central and South America. Six cases of human infections with the onchocercas of animals have been reported outside the areas of endemic human onchocerciasis infection, namely, in the United States, Canada, Switzerland, the Crimea and Japan. Now we want to present the seventh case (as we believe), found in Kharkiv region, Ukraine.

Infections presented as firm subcutaneous nodules that were painful or not and were located in a tendon of an eye muscle, the knee, the wrists (in two patients), and the sole of the foot (in one patient) [9–15]. The cases reported to date all involved a single female worm. In their natural definitive hosts, Onchocerca parasites have a marked predilection for connective tissue and typically are highly coiled in discrete nodules.

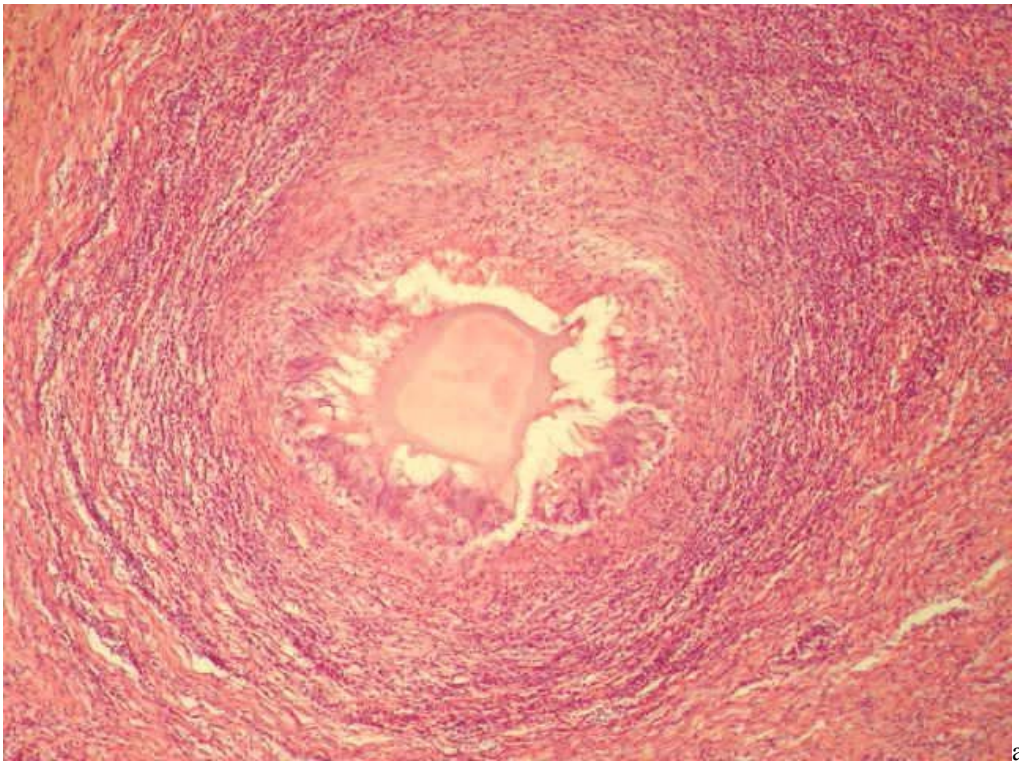
Species of Onchocerca have distinctive morphological features that are evident grossly and in tissue sections of the parasites and that allow an accurate identification to the genus level. Typically, the female worm has a thick, multilayered cuticle which bears prominent annular ridges on the external surface and transverse striae in the underlying layer. The number of striae between consecutive annular ridges is useful in identifying species in many cases [12, 16]. In transverse sections of female worms, the cuticle varies widely in thickness; this is attributed to the annular ridges on the outer surface. In male worms, the cuticle is thin, not visibly divided into layers, and less ornate than that of the female. Although there are marked annular striations in the cuticle of male worms, these are not seen in transverse section. In addition to the cuticle, the musculature and hypodermis have equally distinctive features. It is not unusual for the muscle cells, even in living worms, and particularly in female worms, to appear weak, poorly developed, and somewhat atrophied. In contrast, the cuticle is much thinner and the musculature is much better organized and developed in male worms. Generally, individual muscle cells are coelomyarian type, in which the contractile portion has a loose, fibrillar appearance; there are usually fewer than 12 cells per hemisphere, with those in the ventral region being much taller than those in the dorsal hemisphere. The hypodermis is usually very conspicuous, underlying the bands of muscles, and the lateral chords are equally large and conspicuous. The gut is vestigial and is often overlooked because of its small size and weak nature. Generally, the morphological features of onchocercas are sufficiently characteristic to allow recognition at the genus level. However, assigning an accurate species designation is difficult and often impossible.

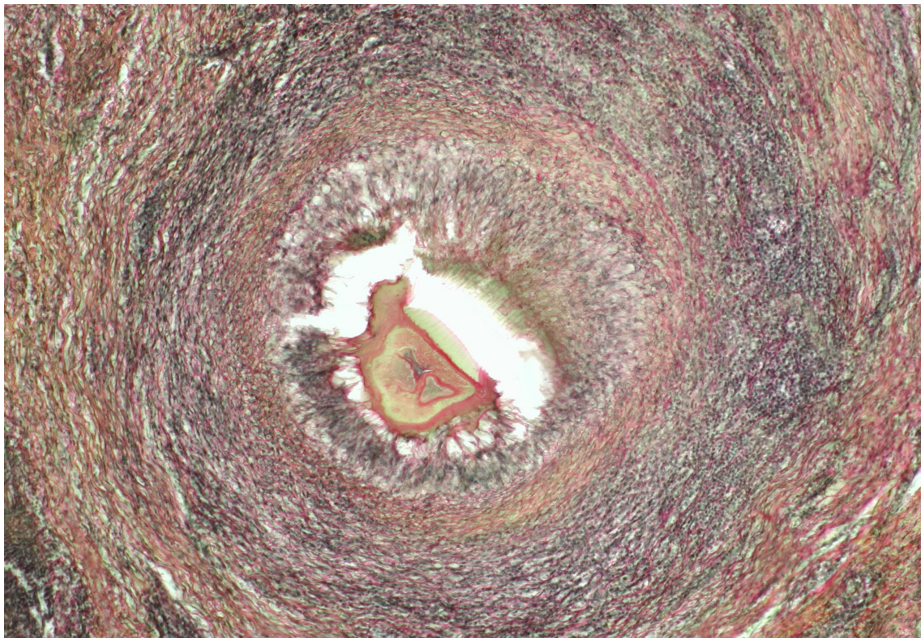
Case 2. A 43 year old woman presented to the gynecology department of Kharkiv Regional Clinical Hospital with complaints of dysmenorrhea, pelvic pressure, frequent urination and constipation. She had no history of previous surgical operations and never travelled outside Ukraine. The clinical diagnosis of multiple uterine

leiomyoma was made after transvaginal ultrasound examination. This diagnosis was confirmed by the radiology department via various imaging techniques. The patient was operated upon and the uterus removed and sent to the pathology department for biopsy investigation.

Macroscopically − Extirpated uterus; the size of the uterus was 8.0×7.0 cm; on the cut surface, there were numerous subserous tumor nodules in diameter from 1.0 to 2.0 cm, grayish color, encapsulated and with fibrous consistency. The fallopian tube had a length of 7.0 cm, diameter of 0.5 cm with shiny serous membrane. The ovary had a size of 5.0×3.0 cm and grayish-brown color, in cross-section two cysts with diameter of 1.5 cm were found. The fragment of omentum, 4.0×2.5 cm in size with yellowish color.

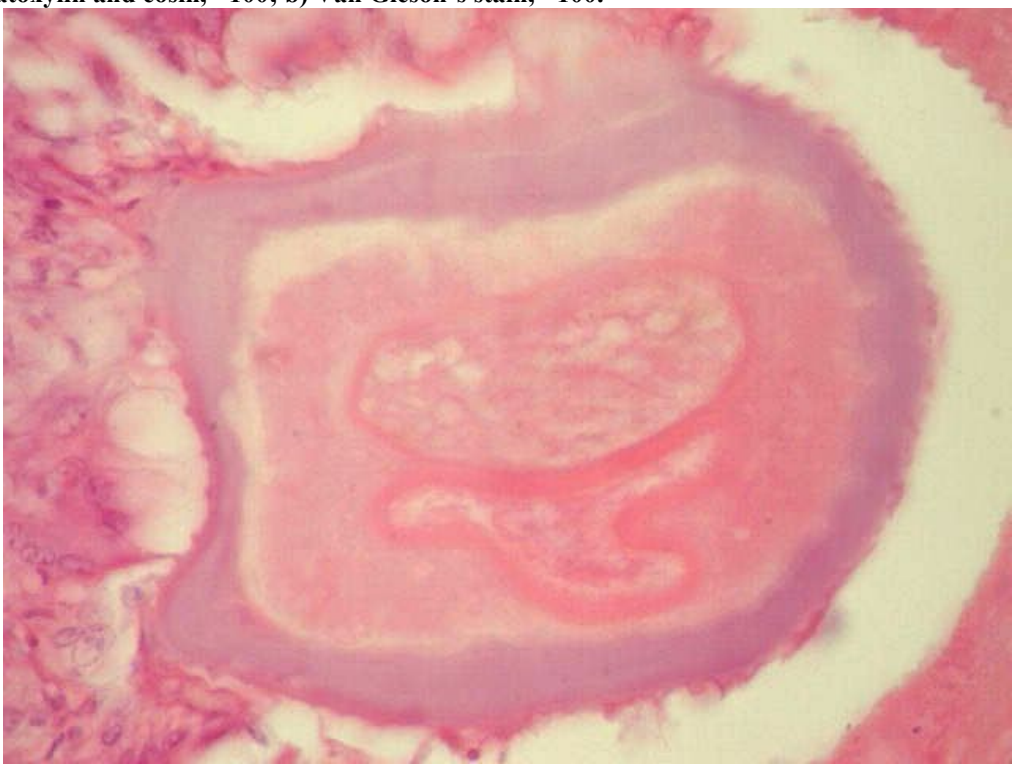
Microscopically – Multiple uterine leiomyoma. Glandular-polypoid hyperplasia of endometrium of secretory type. Chronic cervicitis with Nabothian cysts. In the ovary – the cyst of yellow body. In the omentum – focal granulomatous inflammation with suppuration around the bodies of parasites (fig. 3a, 3b). The parasite was investigated and found to be Enterobius vermicularis (pinworm) (fig. 4a), 4b).


a)

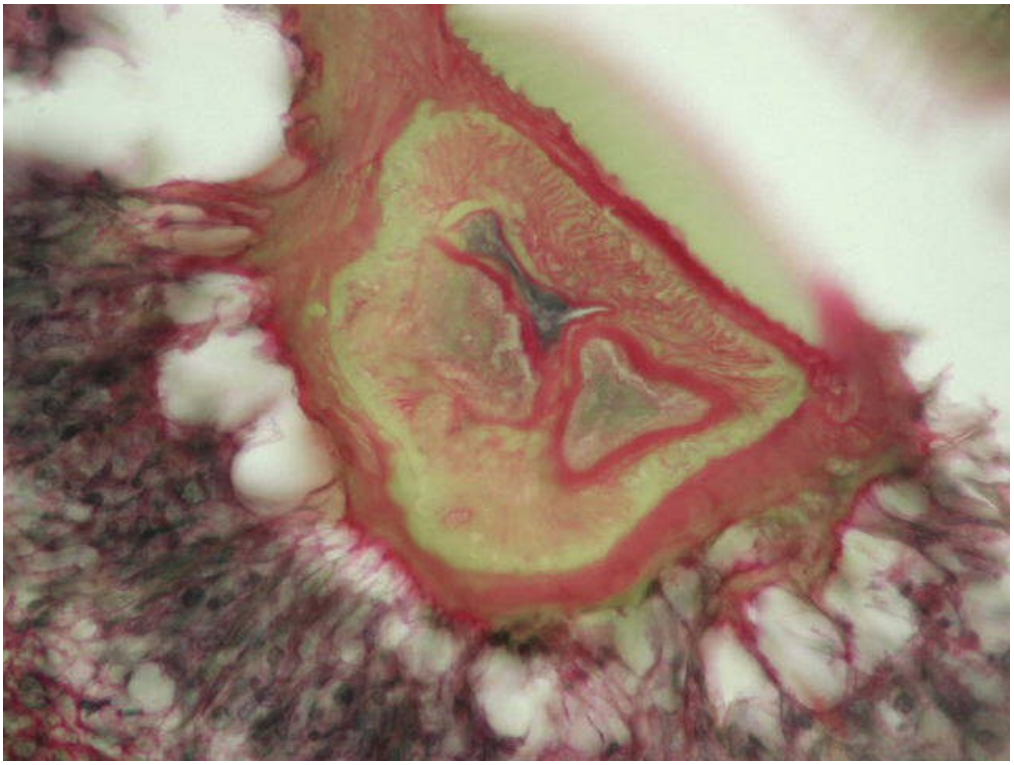


b)

Fig. 3. Focal granulomatous inflammation with suppuration around the bodies of parasites. a) Stained with haematoxylin and eosin, ×100; b) Van Gieson's stain, ×100.



a)



b)

Fig. 4. The parasite which was identified as Enterobius vermicularis (pinworm). a) Stained with haematoxylin and eosin, ×100; b) Van Gieson's stain, ×100.

Enterobius vermicularis (pinworm or threadworm) is a common intestinal parasite. Pinworm infections predominantly occur in young children (5–10 years), who present with perianal and perineal pruritis, but adults may also be affected [17]. Despite this high prevalence, enterobiasis is not usually considered to be a serious disease, although ectopic infections, seen most commonly in females, can cause significant morbidity [18].

The 2–4 week life cycle of Enterobius vermicularis occurs normally in the lumen of the human gastrointestinal tract. Transmission is faecal-oral as a result of self contamination of hands, or ingestion of contaminated fomites. The outer proteinaceous layer of the egg dissolves on exposure to digestive secretions, releasing larvae into the duodenum; the adult worms inhabit the distal small and proximal large bowel, where mating occurs. At night, the gravid female migrates to the anal verge to deposit as many as 10 000 eggs. The eggs embryonate within hours and remain viable for 20 days. These eggs may then infect the same or a new susceptible host through anal-oral transmission, or via "retroinfection". In the latter instance, the larvae migrate from the anal verge back into the gastrointestinal tract where they mature, mate, and continue their life cycle [18].

The chief symptom of classical pinworm infection is pruritis ani, caused by mechanical irritation and allergic reaction, and is often manifest as irritability, insomnia, and enuresis. We have no information about the presence or absence of these features in our patient. Ectopic infections result from spread of larvae from the anal margin to a wide variety of ectopic sites. The local inflammatory response or secondary bacterial infection cause symptoms and clinical presentation. Direct inoculation of larvae may result in infection of distant sites such as the external auditory meatus or conjunctiva, but occasionally the parasites reach internal ectopic sites. Ascent of larvae from the perineum into the female genital tract is the most common, and was the probable route of entry into the peritoneum of our case, although it could also have been as a result of perforation of the intestinal wall. Such navigational errors by the parasite may result in fallopian tube infiltration [19, 20], salpingo-oophoritis [21, 22], tubo-ovarian abscess [23], or granulomata of the vulva, vagina [24], uterus [25–27], fallopian tubes [17], or ovaries [28], and even the human embryo [29, 30].

Escape of worms through the fallopian tubes into the peritoneal cavity can lead to pelvic [26, 28, 31] or abdominal peritonitis [31–33], or granulomata of the pelvic peritoneum [27, 29, 34]. Following entry into the peritoneum, formation of enterobius granulomata in or on the liver [35, 36], spleen, or kidney may occur [17, 18].

Another possible means of ectopic spread into the peritoneum is perforation of the intestine or appendix, allowing penetration of the pinworms through the damaged intestinal wall into the peritoneal cavity. This secondary route of parasite migration helps to account for the reported cases of ectopic infection occurring in males [17].

Females with Enterobius vermicularis infection have an increased incidence of urinary tract infection, probably because of migration of worms into the urethra and bladder, and this may have accounted for the urinary tract infection in our patient. Transfer of enteric or cutaneous organisms to these normally sterile sites along with the pinworms has been documented previously [37], and may be the explanation for the isolation of bacteria from the peritoneum of our patient.

Such ascending genital tract infection in the presence of lower abdominal, adnexal, and cervical motion tenderness fits the definition of pelvic inflammatory disease (PID) [38]. Chlamydia trachomatis, Neisseria gonorrhoeae, bacteroides, and Mycoplasma species are the most common causes of PID, but the presence of eosinophilia might suggest pinworm disease.

In our case pathological examination of the peritoneal biopsy showed an abundance of eosinophils, surrounding the parasite with the formation of a capsule. There were also multiple granuloma formations in various parts of the peritoneum.

Enterobius vermicularis is readily killed with antiparasitic therapy. Reinfection, primarily a result of the ongoing spread of eggs / larvae, which are not affected by the drugs (only adult worms are killed), requires administration of a second dose. Family members and sexual contacts also require therapy to prevent reinfection and spread of disease. Careful handwashing and environmental decontamination are also probably important in reducing transmission.

The sequelae of PID, including chronic pelvic pain (18%), ectopic pregnancy (relative risk increased tenfold), and tubal infertility (up to 20% after one episode) with intra-abdominal scarring [38], highlight the potential importance of ectopic enterobiasis in females. One previous case of infertility was attributed to the pinworm [39]. Our patient has suffered with chronic abdominal pain since the initial presentation, prompting multiple surgical interventions and may be at risk of future problems with infertility, ectopic pregnancy, and continuing abdominal-pelvic pain.

Although most pinworm infections are minor, ectopic infections in the female genital tract can be a diagnostic challenge and may have long term implications for reproductive health.

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ORMS IN SURPRISING PLACES: CLINICAL AND MORPHOLOGICAL FEATURES

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Helminthes are the most common human diseases, which are characterized by involvement in the pathological process of all organs and systems. In this article, the authors discuss a few cases of typical and atypical localizations for parasitic worms such as filarial and pinworms which were recovered from surprising places in the bodies of patients in Kharkiv region. This article will allow the doctors of practical health care to pay special attention to the timely prevention and diagnostics of this pathology.

Key words: helminthes, filarial, pinworm, localization, features.

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ПАРАЗИТАРНЫЕ ЧЕРВИ В НЕОБЫЧНЫХ МЕСТАХ: КЛИНИЧЕСКИЕ И МОРФОЛОГИЧЕСКИЕ ОСОБЕННОСТИ

Адейеми А. А., Борзенкова И. В., Мирошниченко М.С., Плитень О. Н.

Гельминтозы относятся к наиболее широко распространенным заболеваниям человека, при которых в процесс вовлекаются все органы и системы. В статье авторы рассматривают несколько случаев типичных и нетипичных локализаций для паразитических червей (филярия и острица), которые были извлечены из удивительных мест в телах пациентов Харьковской области. Приведенные авторами данные позволят врачам практического здравоохранения обратить особое внимание на своевременную профилактику и диагностику гельминтозов.

Ключевые слова: гельминты, филярия, острица, локализация, особенности.

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ПАРАЗИТАРНІ ЧЕРВ'ЯКИ В НЕЗВИЧАЙНИХ МІСЦЯХ: КЛІНІЧНІ ТА МОРФОЛОГІЧНІ

ОСОБЛИВОСТІ

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Гельмінтози відносяться до найпоширеніших захворювань людини, при яких у процес залучаються всі органи і системи. У статті автори розглядають кілька випадків типових і нетипових локалізацій для паразитарних черв'яків (філярія та гостриця), які були вилучені з незвичайних місць в тілах пацієнтів Харківської області. Наведені авторами дані дозволять лікарям практичної охорони здоров'я звернути особливу увагу на своєчасну профілактику і діагностику гельмінтозів.

Ключові слова: гельмінти, філярія, гостриця, локалізація, особливості.