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RESEARCH ARTICLE

MIXED MALARIA INFECTION: ABOUT AN IMPORTED CASE AND REVIEW OF THE LITERATURE

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Abstract

Mixed malaria infections with Plasmodium are rare and can lead to more serious complications than a single infection. They are particularly common in travelers to malaria-endemic areas. Proper diagnosis and treatment of cases help to control this infection.We report the case of a rare and severe malaria infection, associating two plasmodial species: Plasmodium falciparum and P.vivax, with high parasitemia and fatal complication.

Introduction:-

Malaria is considered one of the most common parasitic infections in the world, with high mortality rates. Five known species are responsible for human malaria: Plasmodium. falciparum, P. vivax, P. ovale, P. malariae and P.knowlesi (1).

P. falciparum and P. vivax have the widest distribution, while P. malariae has a lower prevalence (2).

Mixed malaria infections with Plasmodium are rare, and can lead to more serious complications than a single infection. Malaria-related morbidity and mortality are mainly caused by Plasmodium falciparum.

We report the case of a severe and rare malaria infection, with two plasmodial species and whose diagnosis was established by the Gold standard associating the thick drop and the thin blood smear stained by the May Grunwald Giemsa (MGG) as recommended by the WHO.

Observation:-

This is a mixed malaria infection with two plasmodial species in a 45-year-old Moroccan patient, after a 12-day stay in Cameroon without antimalarial chemoprophylaxis. Five days after his return, he presented a fever with jaundice, vomiting and consciousness disorders. On admission to the emergency room, the blood test showed anemia at 8.9 g/dl hemoglobin, hyperglycemia at 2.25 g/dl, thrombocytopenia at 32,000/mm3 and creatinemia at 60 mg/l.

Given the patient's stay in a malaria endemic area, a thin blood smear (FSM) and a thick blood drop (GE) were performed urgently.

The FSM stained with MGG showed the presence of normal sized red blood cells parasitized by kitten-ring trophozoites, helmet trophozoites, and the presence of marginalized forms with multiple parasites in the same red

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blood cell, as well as the presence of characteristic banana gametocytes, in favor of a *Plasmodium falciparum* infection (figure 1 and 2).

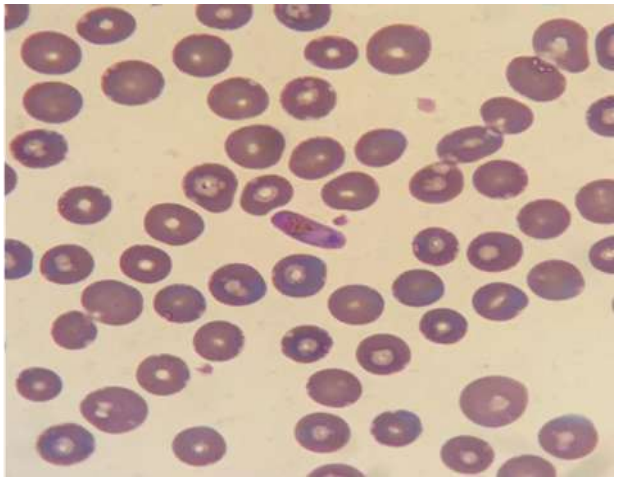

Figure 1:- Banana-shaped gametocytes of Plasmodium falciparumin thin blood smear.

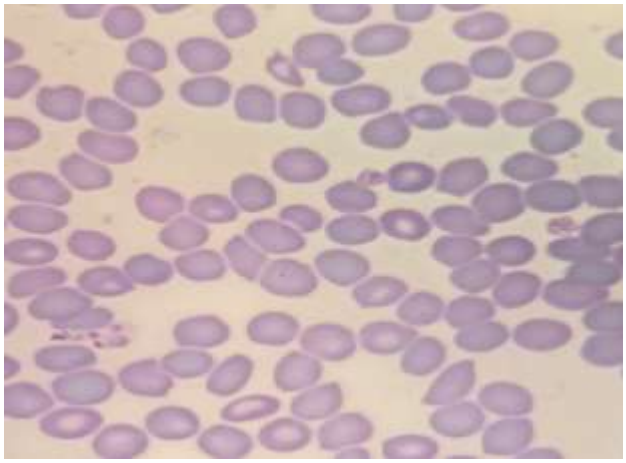

Figure 2:- classic "head phone" form of Plasmodium falciparum trophozoite.

In other larger parasitized red blood cells, trophozoites of amoeboid shape, in rings with thick cytoplasm and the presence of schizonts occupying the whole cell, were seen, the tt being in favor of a Plasmodium Vivax infection(figure3)

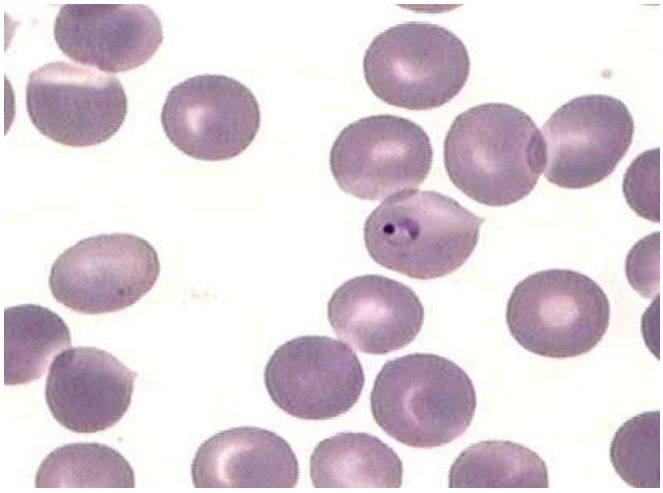

Figure 3:- Ameboid ring of *Plasmodium vivax*in an enlarged infected RBC.

Parasitemia calculated on thin smears was 9%. A rapid antigenic test (PALUTOP+4) was also carried out and was positive for two plasmodial species (Figure 4).

Figure 4:- Rapid antigenic test positive for Plasmodium falciparum and vivax.

Thus, the diagnosis of severe mixed P. falciparum and P. vivax malaria was made and the result was called to the emergency physicians. An anti-malarial treatment: IV artesunate at a dose of 4 mg / kg was administered and the patient was placed under clinical-biological surveillance in the Intensive Care Unit where he developed a metabolic acidosis and on the second day of treatment, the patient died following a multivisceral failure.

Discussion:-

Malaria, the world's leading parasitic endemic and third largest infectious disease, is a vector-borne parasitic disease that occurs in intertropical regions, including three main areas of high transmission: sub-Saharan Africa, South-East Asia and South America. According to the latest WHO World Malaria Report 2021, there will be an estimated 241 million cases of malaria and 627,000 deaths due to malaria worldwide (2).

After several decades of malaria control, Morocco was certified by the WHO as free of indigenous malaria in 2010. Indeed, since the year 2005 no cases of indigenous malaria have beeń recorded.

Yet, Moroccan health facilities record every year the increase in the number of new cases of imported malaria estimated at around 100 new patients per year, in connection with the increase in air flows and movements of travelers from and to malaria-endemic countries, in the context of humanitarian and military medical missions, student exchanges, trade exchanges, and also in connection with illegal emigration. (3)

The diagnosis of malaria is usually based on a combination of epidemiological factors, such as return from an endemic area, and clinical factors, essentially fever, which is a compatible but not exclusive indicator of the diagnosis, requiring biological confirmation by parasitological examination of the blood, associating an EWG with FSM.

The disturbance of certain biological parameters such as anemia, thrombocytopenia and hypertriglyceridemia may also point to the diagnosis (4).

In this patient, the fever occurring on return from a malaria-endemic area (Cameroon) and the presence of anemia and thrombocytopenia were suggestive of malaria.

Mixed malaria infections are often unrecognized or underestimated, as a small proportion (2%) is individualized by microscopy (5,6). This may be due to the low density of one Plasmodium species compared to the other (7). In our case, both Plasmodium species were equally represented at the FSM and clearly discernible, the rapid immunochromatographic test also showed infection with two plasmodial species.

Mixed malaria infection affects older individuals more than children under two years of age according to several authors who have suggested that maternal antibodies may be the source of protection against mixed malaria (8).

The main complications of severe mixed malaria are considered to be the same as those defined for P. falciparum by WHO, and include respiratory disorders, acidosis, pulmonary edema, disturbances of consciousness, convulsions

(more than two episodes in 24 h), prostration, hypotension, jaundice, severe anemia, disseminated intravascular coagulation (DIC), hypoglycemia, and parasitaemia>4%. (9). Three studies have shown that patients with mixed infection have a significantly higher risk of developing severe malaria than patients with P. falciparum monoinfection (10, 11,12).

The most common severe complications in patients with P. falciparum monoinfection were: severe anemia (57.6%), pulmonary complications (14.6%) and renal failure (11.4%). Concerning patients with a mixed plasmodial infection, they were more prone to severe anemia (65.8% vs 57.6%), pulmonary complications (20.9% vs 14.6%) and multivisceral failure (13.1% vs 3.95%) (10, 11,12).

For our patient, on admission, he was already at the stage of multiple complications as he presented disorders of consciousness, jaundice, vomiting, anemia at 8.9 g/dl, high creatinine level at 60mg/l and high parasitemia at 9%. In only 48 hours, and under treatment, metabolic acidosis sets in and multivisceral failure leads to death.

In misdiagnosed mixed malaria infection, treatment of Plasmodium vivax as a single infection would increase P. falciparum parasitemia, leading to the development of severe P. falciparum malaria and eventual treatment failure due to antimalarial drug resistance. This explains the high mortality rate in severe mixed infections (0.9%) compared to mono-infection (0.6%) [4].

The main strategy in the treatment of uncomplicated malaria is oral therapy with a combination of two agents, Artemisinin and a partner drug that eliminates remaining parasites or Chloroquine monotherapy (in case of Chloroquine sensitivity) (WHO, 2020). Treatment of Chloroquine-resistant P. falciparum should be administered in the setting of exposure in an area of known Chloroquine resistance, but also in the case of an unknown prevalence of Chloroquine resistance or uncertain exposure history. As a result, artemisinin-based combination therapies (ACTs) have become the first line of treatment for P. falciparum and mixed malaria infections. ACT regimens have few side effects and act on all asexual stages of the parasite in the bloodstream, resulting in rapid elimination of the infection (14).

The diagnosis of mixed malaria infection and the identification of the incriminating species is crucial for the therapeutic decision and for the overall follow-up of the patient, given the high risk of complications (13 ,14).

PCR is much more sensitive than microscopy and rapid diagnostic tests for detecting and identifying mixed infections in cases of suspected parasitism by more than one malarial species (14).

However, the high cost of this technique remains an obstacle to its use. Nevertheless, it is necessary to pursue the detection and surveillance of mixed infections with routine microscopy and with rapid antigenic tests which remain more efficient than microscopy. (14).

Conclusion: -

Mixed malaria infections are often unrecognized and carry a greater risk of complication than single malaria species infections. Prompt and accurate diagnosis and appropriate treatment of cases is necessary to control the disease and deal with potential complications. Consultation with a physician prior to travel to malaria-endemic areas is necessary for the prescription of antimalarial chemoprophylaxis and awareness of the risk of exposure as well as necessary prevention tools including the use of insecticide-treated nets and indoor residual spraying.

References:-

1. Antinori S, Galimberti L, Milazzo L, et al. : Biology of human malaria plasmodia including Plasmodium knowlesi. Mediterr J Hematol Infect Dis. 2012;4(1):e2012013. 10.4084/MJHID.2012.013 [PMC free article] [PubMed] [CrossRef] [Google Scholar]
2. Ashley EA, Phyo AP, Woodrow CJ: Malaria. Lancet. 2018;391(10130):1608–1621. 10.1016/S0140-6736(18)30324-6 [PubMed] [CrossRef] [Google Scholar]
3. (https://www.mmv.org/sites/default/files/uploads/docs/publications/World_Malaria_Report_2021.pdf
4. « World Malaria Report 2021 | Medicines for Malaria Venture ». https://www.mmv.org/newsroom/publications/world-malaria-report-2021

5. World Health Organization, Regional Office for the Eastern Mediterranean Morocco. Ministry of Health. Le paludisme au Maroc: une lutte sans relâche, une perspective d'élimination
6. Khermach A, Khalki H, Louzi L, Zinebi A, Moudden K, ElbaajM.Perturbations biologiques au cours du paludisme: à propos de trentecas. Pan Afr Med J.2017;26. doi:10.11604/pamj.2017.26.174.9008
7. Looareesuwan, S., White, N. J., Chittamas, S., Bunnag, D. &Harinasuta, T. High rate of Plasmodium vivax relapse following treatment of falciparum malaria in Thailand. Lancet 2, 1052–1055. https ://doi.org/10.1016/s0140 -6736(87)91479 -6 (1987).
8. McKenzie, F. E. & Bossert, W. H. Multispecies Plasmodium infections of humans. J. Parasitol. 85, 12–18 (1999)
9. Mayxay, M., Pukrittayakamee, S., Newton, P. N. & White, N. J. Mixed-species malaria infections in humans. Trends Parasitol. 20,233–240. https ://doi.org/10.1016/j.pt.2004.03.006 (2004).
10. 10 Sitali, L. et al. Patterns of mixed Plasmodium species infections among children six years and under in selected malaria hyperendemiccommunities of Zambia: population-based survey observations. BMC Infect Dis. 15, 204. https ://doi.org/10.1186/s12879-015-0935-7 (2015)
11. WHO. Guidelines for the treatment of malaria. https ://www.who.int/malar ia/publicatio ns/atoz/97892 41549 127/en/ (2014).
12. Chaparro, P., Padilla, J., Vallejo, A. F. & Herrera, S. Characterization of a malaria outbreak in Colombia in 2010. Malar. J. https ://doi.org/10.1186/1475-2875-12-330 (2013).
13. Chaparro-Narvaez, P. E. et al. Clinical and epidemiological aspects of complicated malaria in Colombia, 2007–2013. Malar. J. 15.
14. Obare, P. et al. Misclassification of Plasmodium infections by conventional microscopy and the impact of remedial training on theproficiency of laboratory technicians in species identification. Malar. J. 12, 113. https ://doi.org/10.1186/1475-2875-12-113 (2013).