Role of persistent processus vaginalis in hydroceles found in a tropical population

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Background: Lymphatic obstruction by *Wuchereria bancrofti* is thought to be the mechanism for development of tropical hydrocele in men and for elephantiasis, mostly in women. Hydrocele prevalence is used to determine the effectiveness of parasite eradication programs.

Methods: We maintained a prospective log of operations performed at 1 Canadian Field Hospital during its relief mission to Léogâne, Haiti. Information regarding duration of symptoms, type of previous surgery (if any), surgical approach, associated inguinal hernia and volume and appearance of hydrocele fluid in patients with tropical hydroceles were recorded.

Results: From January to March 2010, 4922 patients were seen, none of whom had elephantiasis. Of the 64 patients who collectively underwent 69 inguino-scrotal procedures, 5 patients had inguinal hernia repair several years after hydrocele excision via the scrotum, 19 patients with bilateral hydroceles underwent a scrotum-only approach, and 45 patients had an inguinal approach (33 unilateral and 12 bilateral) to repair 57 hydroceles. A patent processus vaginalis was present in 50 of 57 (88%) hydroceles where the groin was explored.

Conclusion: Hydroceles remain common in Léogâne despite successful eradication of filariasis with mass drug administration using diethylcarbamazine-fortified cooking salt. Persistent patent processus vaginalis is a more likely cause than persistent filariasis. There is probably little difference between hydrocele in developed countries and tropical hydrocele other than neglect. Hydrocele prevalence is not a measure of the effectiveness of parasite eradication programs.

Contexte : On croit qu'une obstruction lymphatique par *Wuchereria bancrofti* serait le mécanisme à l'origine de l'hydrocèle tropicale chez les hommes et de l'éléphantiasis, surtout chez les femmes. La prévalence de l'hydrocèle est utilisée pour déterminer l'efficacité des programmes d'éradication parasitaire.

Méthodes : Nous avons tenu un registre prospectif des interventions effectuées au 1er Hôpital de campagne du Canada durant une mission humanitaire à Léogâne, en Haïti. Nous avons noté la durée des symptômes, les antécédents chirurgicaux (le cas échéant), l'approche chirurgicale, l'hernie inguinale associée, de même que le volume et l'aspect du liquide présent dans l'hydrocèle de patients atteints d'une hydrocèle tropicale.

Résultats : De janvier à mars 2010, 4922 patients ont été vus et aucun ne souffrait d'éléphantiasis. Sur les 64 patients qui ont subi en tout 69 interventions inguino-scrotales, 5 ont subi une réparation d'hernie inguinale plusieurs années après l'exérèse d'une hydrocèle par voie scrotale, 19 patients porteurs d'hydrocèles bilatérales ont subi l'intervention exclusivement par approche scrotale et 45 patients, par approche inguinale (33 unilatérales et 12 bilatérales) pour la réparation de 57 hydrocèles. Une ouverture du processus vaginal a été observée dans 50 cas d'hydrocèle sur 57 (88 %) où on a procédé à un examen inguinal.

Conclusion : L'hydrocèle demeure fréquente à Léogâne, malgré l'éradication efficace de la filariose, grâce à un traitement médicamenteux de masse par le biais de sel pour la cuisson additionné de diéthylcarbamazine. La persistance de l'ouverture du processus vaginal est une cause plus probable de filariose persistante. Il y a probablement peu de différences entre les cas d'hydrocèle recensés dans les pays industrialisés et les hydrocèles tropicales, à part la négligence. La prévalence de l'hydrocèle ne permet pas d'évaluer l'efficacité des programmes d'éradication parasitaire.

The recent earthquake in Haiti has highlighted not only the response required for such disasters, but also the ongoing battle against endemic diseases, such as lymphatic filariasis. 1 Canadian Field Hospital was deployed to Léogâne, the epicentre of the earthquake, on Jan. 12, 2010. *Wuchereria bancrofti*, the most common causative organism of lymphatic filariasis, was endemic in the Léogâne area until eradication by mass drug administration using diethylcarbamazine (DEC) in cooking salt.[1] Once the injured were cared for, the surgical needs of the community were addressed. Large numbers of male patients came to our hospital seeking help for disabling hydroceles. Hydroceles in a tropical population, sometimes called tropical hydroceles, are distinguished from those seen in temperate zones by their high prevalence and massive size. Lymphatic obstruction is thought to be the mechanism for development of tropical hydrocele.[2] Eradication of the parasite and excision of the hydrocele sac via a scrotal incision is the preferred management.[2] In Canada, hydroceles in children are approached through an inguinal incision so that the associated hernia can be controlled, whereas the scrotal approach is primarily used in adults to excise the sac and evert the remnant. Initially, we treated children using the inguinal approach. We then operated on several adults with symptomatic inguinal hernias whose ipsilateral hydroceles had previously been excised via the scrotal approach. We became concerned that adult patients with hydroceles in Haiti had persistence of the processus vaginalis, which had been neglected since childhood. We decided to use the inguinal approach to treat hydroceles in adults if time and resources permitted.

Methods

We maintained a prospective log of operations performed during the mission to Léogâne. Information regarding duration of symptoms, type of previous surgery (if any), surgical approach, associated inguinal hernia and volume and appearance of hydrocele fluid in patients with tropical hydroceles were recorded.

Results

From January to March 2010 in Léogâne, Haiti, 1 Canadian Field Hospital treated 4922 patients, none of whom had elephantiasis. Large numbers of male patients reported disabling hydroceles. Two female patients with elephantiasis presented to another Canadian Forces medical unit on remote village outreach missions, but none presented in the area of Léogâne. Medical treatment programs for filariasis were already well developed in the Léogâne area and were not disrupted by the earthquake. Surgical treatment was offered to adults whose mobility was limited by the hydrocele and to all children. In total, 64 patients were selected for hydrocele surgery. Sixty-nine inguino-scrotal procedures were performed: 19 patients underwent a scrotum-only approach to bilateral hydroceles, 2 patients had inguinal hernia repair 1–2 years after scrotal surgery for hydroceles, 3 children without hydroceles had inguinal hernia repair alone, and the remaining 45 patients had an inguinal approach (33 unilateral and 12 bilateral) to repair 57 hydroceles. A patent processus vaginalis was present in 50 of 57 (88%) hydroceles where the groin was explored. Straw-coloured serous fluid was found in each hydrocele, but none had the appearance of chyle. The volume of each hydrocele (range 50–1700 mL) increased with age (range 5–70 yr), and no patients had ascites.

Discussion

The World Health Organization (WHO) estimates that 120 million people in tropical and subtropical areas of the world are infected with *W. bancrofti* or *Brugia malayi*; most are asymptomatic. Almost 25 million men have genital disease, and 15 million people, the majority of whom are women, have lymphedema or elephantiasis of the leg.[3] The WHO and local experts believe that hydrocele is the most common manifestation of filariasis in men.[3,4] The WHO uses prevalence of hydroceles as a measure of effectiveness of filaria eradication programs.[3,5] Surgical treatment of hydroceles is often difficult to acquire in endemic areas because of poor health care infrastructure. Untreated hydroceles become massive, disabling the patient and startling visiting medics. Failure to treat hydrocele in childhood will result in a high prevalence of the condition. Colocation of endemic filariasis with prevalent massive hydroceles has linked the 2 in a cause-and-effect relationship. While it is to be expected that a high percentage of male patients with hydrocele would be positive for filaria, the rate is not much different to background infection rates in endemic areas.[6] Several studies have shown that almost half the patients with tropical hydrocele in endemic areas, before eradication programs, do not have evidence of infection with filaria.[6,7]

Mass drug administration has been used as part of a global project to eliminate lymphatic filariasis. Recently this has included the use of DEC-fortified cooking salt, which is effective against adult and larval forms of the parasite and is thought to have been responsible for the eradication of lymphatic filariasis in China.[8] The program has been particularly successful in Léogâne, where we found DEC-fortified salt to be commonly used.[9] Despite an almost complete elimination of elephantiasis in Léogâne (the 2 patients seen were in remote villages not receiving DEC), hydroceles remain a very common affliction. Because of limited resources, we had to reserve surgery for adults with massive hydroceles that limited mobility or for children. We found a persistent processus vaginalis in almost all of these patients. Hydroceles in this area, and probably tropical hydroceles in general, are more likely to

be due to a persistent patent processus vaginalis than to persistent filariasis. This is the mechanism of hydrocele formation in the developed world where treatment is usually carried out in childhood. There is probably little difference between hydrocele in developed countries and tropical hydrocele other than neglect. The epithet "tropical" more properly refers to the social condition of the area rather than a specific pathogenesis of the hydrocele.

Failure of neonatal obliteration of the processus vaginalis is a mechanism for both inguinal hernia and hydrocele development. Persistence of smooth muscle in the peritoneal tissue of the processus vaginalis has been shown in patients with hernias or hydroceles but not in the peritoneum of patients without hernias or hydroceles.[10] Immunohistochemistry shows these smooth muscle cells to be in an intermediate state of differentiation, suggesting that a drive to apoptosis, which would have resulted in obliteration of the processus vaginalis, was interrupted.[11] There is no reason to believe that these mechanisms would be any different in the tropics or that they would be influenced by filariasis.

Elephantiasis has been known to man since ancient times, but was confused with leprosy until the work of Avicenna in the 11th century.[12] Little progress was made until the mid-19th century, when Otto Wucherer (Brazil, 1868) and Timothy Lewis (India, 1872) independently demonstrated the presence of filarial worms in chylous urine.[12] Patrick Manson, working in China in 1885, realized that filaria were responsible for elephantiasis of the scrotal skin.[12] In 1877, Joseph Bancroft added hydrocele to the list of conditions caused by filaria.[12] The causative role of filariasis in tropical hydrocele became dogma in the shadow of these giants of tropical medicine, all of whom could find evidence of filaria in chylous urine, but not in hydrocele fluid. More recently, disruption of lymphatics and abnormal connection to the renal pelvis have been shown by lymphangiography in patients with filarial chyluria.[13] Prior to filaria eradication programs, chylous fluid was sometimes found in hydroceles. This was most likely due to abnormal connections between blocked mesenteric lymphatics and peritoneum in patients with chylous ascites that communicated with the scrotum.[4] We did not find chyle in any of the hydroceles or ascites in our patients, who came from an area where filaria eradication programs have been successful.

Conclusion

We recommend that the associated inguinal hernia be repaired when a hydrocele is surgically treated in the tropics. However, excision of the hydrocele sac via a scrotal incision remains a valid approach in austere conditions because it is easier than the inguinal approach, especially if bilateral surgery is required. There is a relatively low incidence of subsequent symptomatic inguinal hernia, and it can be treated separately.[2] This information is useful not only to surgeons working in endemic areas, but also to surgeons in Europe and North America, where immigration from these areas is common. More importantly, this report suggests that hydrocele prevalence is a poor means for the WHO to monitor the effectiveness of filaria eradication programs.[5]

Competing interests: None declared.

Contributors: V.C. McAlister designed the study and wrote the article. Both authors acquired and analyzed data, reviewed the article and approved its publication.

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