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Leaving no one behind: hernia, a neglected surgical condition identified during hydrocele surgery camps in Tanzania

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Programs focused on elimination of lymphatic filariasis include the provision of surgery to address hydrocele, a complication of infection. Corrective surgical interventions are fully funded so that affected men in Tanzania can live normal and productive lives. Active case finding is used to identify candidates for hydrocele surgery. Oftentimes this results in men being identified as needing a hydrocelectomy when they actually have inguinal hernias. Given different funding streams, men with hernias do not have access to funded surgeries and are turned away during hydrocele surgical camps despite a clear need for surgical intervention; this poses an ethical dilemma. Also, hernias can occur in conjunction with hydroceles or be misdiagnosed as hydrocele. When misdiagnosis is identified during surgery, and there are no prior preparations to address both, complications can occur. Support from the private sector to complement NTD programs as a viable solution to providing hernia surgeries during hydrocelectomy camps has been used on a small scale in Tanzania and could be replicated on a larger scale.

KEYWORDS

hydrocele, hernia, lymphatic filariasis, leave no one behind, Tanzania

1 Introduction

The global burden of groin hernia and hydrocele is substantial, with an estimated 223 million people worldwide suffering from inguinal hernia and nearly 19.43 million men affected by filarial hydrocele (1–4). From 1990 to 2019, the global number of inguinal hernias increased (5). Elective hernia repair and hydrocelectomy are effective public health interventions that can prevent life-threatening complications and improve quality of life (6, 7). Corrective surgeries for both inguinal hernias and hydrocele surgeries are cost-effective, especially when conducted in a surgical camp context, even when compared to more traditional public health interventions. However, since the funding streams are different for

the surgical interventions patients with inguinal hernias are often left behind and cannot receive the treatment needed when funding for surgeries is provided. This paper first describes the context in Tanzania and summarizes the paucity of literature available on both morbidities, and then explains the challenges patients in Tanzania are facing, as well as some viable recommendations to address this issue.

There is a paucity of research studies available on co-morbidity related to hernia and filarial hydrocele in sub-Saharan Africa. While some studies do exist and are referred to below, there are several key gaps in the hernia and hydrocele literature, particularly in low-resource settings. These include a) limited epidemiological data on the prevalence and incidence of hernias and hydroceles in low-resource settings with existing studies often have small sample sizes or focus on specific populations, making it challenging to generalize findings; b) the literature lacks a thorough understanding of the risk factors associated with hernias and hydroceles in low-resource settings, mostly noting that heavy labor is often considered a risk factor, its exact contribution and interaction with other factors remain unclear and the role of genetics, race, and environmental factors needs further exploration; c) there is a need to better understand the barriers to accessing treatment for hernias and hydroceles in low-resource settings; d) more research is needed to explore the exact impact of untreated hernias and hydroceles on the quality of life of affected individuals in low-resource settings; e) and finally, while surgical repair is the primary treatment for hernias and hydroceles, there is limited evidence on the effectiveness and outcomes of different surgical techniques in low-resource settings. Research is needed to evaluate the feasibility, safety, and long-term success rates of various interventions in resource-constrained environments (8–10). Below we will summarize some key studies that help to shed light on what we know, and comment on our experiences in Tanzania.

1.1 Hernia in sub-Saharan Africa

Scrotal conditions in sub-Saharan Africa differ significantly from those in high-income countries, with hernias being a commonly neglected surgical condition that often manifests as a scrotal rather than a groin problem, similar to hydroceles. Yet, as a largely neglected surgical condition, the exact prevalence is hard to measure. Published information on inguinal hernia epidemiology in low-resource settings is limited. It shows varying hernia prevalence in men, ranging from 7.7 percent in rural Ghana to 25 percent on the island of Pemba in Tanzania. A more recent study conducted in eastern Uganda in 2014 found a prevalence of untreated hernias in men at 6.6 percent, with an overall hernia prevalence, including repaired hernias, of 9.4 percent (11). One study in Tanzania also found an estimated high prevalence of inguinal hernias in Tanzanian men at 12.1 percent. This higher prevalence is attributed to the lack of access to surgery in Sub-Saharan Africa, as factors like heavy labor and race have not been conclusively linked to inguinal hernia risk in the literature (12).

The elective treatment of hernias is rare due to insufficient human resources and limited access to skilled surgical services. In Cameroon, 21.9% of study participants with untreated hernias never presented for treatment, due to the perceived high cost of care (13). While tension-free mesh repair is the standard of care for groin hernia in high-income countries (HICs), it remains largely unavailable to most patients in low and middle-income countries (LMICs). When hernias are addressed as emergencies, procedures are often conducted without mesh, significantly increasing the risk of recurrence. Sub-Saharan Africa has the lowest usage of mesh and only 50% of inguinal hernias in LMIC use mesh, compared to 97.2% in the UK (14). The use of mosquito-net mesh may offer a safe and cost-effective solution to address this disparity, but its use is still controversial. Until a proven, safe mesh option becomes widely available, promoting increased access to well-established tissue techniques for groin hernia repair is essential (15).

1.2 Hydrocele in sub-Saharan Africa

A hydrocele is an abnormal accumulation of fluid typically found in the scrotum of men. In adults, the development of hydroceles can be associated with the obstruction of testicular venous or lymphatic vessels. In tropical regions, particularly in LMICs, the most significant risk factor for noncommunicating hydrocele development is lymphatic filariasis (LF), caused by infection with the mosquito-borne worm *Wuchereria bancrofti*. This infection leads to more than 50 percent of infected men developing chronic hydroceles as they age (16, 17). In sub-Saharan African communities currently or formerly endemic to lymphatic filariasis, it is estimated that the prevalence of hydrocele is high, with an incidence of between 20-28% (18, 19).

2 A case of hernia patients left behind: hydrocele surgical camps in Tanzania

While this paper will focus on the Tanzanian experience, this issue is common across sub-Saharan Africa, particularly in countries that have significant hydrocele burdens that are being addressed through donor funding. The NTD program in Tanzania started implementing LF morbidity interventions through surgical camps in 2008, and since then, 10,593 patients have been operated on. From the patients identified at the camp, the surgical teams estimate that 1 in 5 patients present with hernia. The perceptual similarity of hernia and hydrocele to patients and the similar vocabulary used to describe the conditions, as observed in the common presentation of “enlarged scrotal swelling,” adds an additional layer of complexity to the ethical dilemma faced by surgeons and the public health community outlined in this paper. Surgeons find it difficult to explain to patients why some are denied surgery while others with a similar presentation receive prompt treatment and care. In the highly prevalent areas where hydrocelectomy camps are often conducted annually for several

consecutive years, patients with hernias are often turned away without surgery. Despite this, they persistently hope for consideration in the next camp and continue to return. This recurring situation highlights the urgent need to explore possibilities for acquiring funding for hernia surgeries and integrating hernia treatment into these camps.

Despite the clear clinical distinctions between hydrocele and hernia, both conditions significantly impact the quality of life for those affected, carrying the risk of severe complications such as Fournier's gangrene in untreated hydroceles and bowel obstruction in hernias. In hydrocele camps, Surgery for hydroceles is funded, while those for hernias are not. Consequently, during the screening process, surgeons face the challenging task of prioritizing cases based on available funding rather than just clinical urgency. This ethical complexity becomes evident when surgeons are compelled to treat smaller hydroceles while leaving larger isolated hernias untreated due to financial constraints.

Hydrocele surgery camps, often donor-funded, aim to provide surgical treatment for individuals with hydroceles. Surgeons prefer to conduct both hydrocele and hernia surgeries in these camps for ethical reasons but are constrained by donor restrictions that only cover hydrocele surgeries. This is particularly unfortunate as hernia surgeries are more cost-effective when addressed during these camps, costing USD 135 compared to USD 215 at district health facilities. These interventions offer a crucial opportunity for patients to return home and engage in social and economic activities within their communities.

We argue that while the neglected tropical disease (NTD) and global health communities underline the importance of leaving no one behind, men with hernias are being left behind. A significant portion of the global population lacks access to safe groin hernia surgery and hydrocelectomy, leading to higher morbidity and mortality rates in low- and middle-income countries (LMICs) (20–22). Limited access to hydrocelectomy perpetuates the suffering of individuals with disfiguring filarial hydroceles, particularly among the world's poorest communities. During hydrocele case-finding, community health workers have a hard time distinguishing between hernias and hydroceles, meaning that on the day of organized camps, hernia patients also inevitably present themselves. Yet, men who present with hernias instead of hydroceles are often turned away. For this reason, hernias can be considered neglected surgical conditions.

The paper argues that, despite the emphasis on leaving no one behind in the neglected tropical disease (NTD) and global health communities, men with hernias are being overlooked. A substantial portion of the global population lacks access to safe groin hernia surgery and hydrocelectomy, contributing to higher morbidity and mortality rates in low- and middle-income countries (LMICs) (20–22). Limited access to hydrocelectomy perpetuates the suffering of individuals with disfiguring filarial hydroceles, particularly in the world's poorest communities. During hydrocele case-finding, community health workers struggle to distinguish between hernias and hydroceles, resulting in hernia patients presenting themselves on the day of organized camps but often being turned away. As a result, hernias can be considered neglected surgical conditions.

3 Discussion

Addressing both hernias and hydroceles yields a compounded advantage by alleviating patient suffering and preventing potential complications, which can lead to fatal outcomes. Interestingly, while both hernias and hydroceles manifest within the scrotum, the integration of hernia treatment into hydrocele surgery remains underexplored. Hernias are occasionally discovered incidentally during hydrocele surgeries, prompting ethical considerations, including patient deselection based on apparent hernias and the need for supplemental funding to address additional hernia surgeries.

In order to effectively integrate hernia care into hydrocele surgical camps, additional training and clinical inputs are needed. While, as noted above, the utilization of mesh stands as the gold standard for hernia care, its availability, particularly in the context of commercial availability and sterilization capacities for materials like mosquito mesh, poses a critical concern. Efforts to obtain mesh, including donations, are essential to ensure adequate supplies for surgeries. Distinguishing between regional anesthesia for hernia repair and local anesthesia for hydrocele surgery underscores the necessity for accommodating additional requirements specific to hernia treatment, such as provisions for regional anesthesia. In some instances, the possibility of using general anesthesia for hernia cases must be considered, further emphasizing the distinct nature of hernia treatment despite its scrotal association.

Addressing both hernia and filarial hydrocele should be a high priority on the global surgery agenda. Basic surgical care, particularly essential procedures like groin herniorrhaphy and hydrocelectomy, is a crucial part of healthcare services that should be readily available at first-level hospitals. Efforts to ensure equitable provision of these surgeries in LMICs have the potential to strengthen health systems and increase much-needed hospital capacity. Furthermore, addressing the gaps in the research literature is essential for developing effective strategies to prevent, diagnose, and manage hernias and hydroceles in low-resource settings and improve the overall health outcomes of affected populations.

3.1 Recommendations

We are providing some recommendations on how to address this challenge. First, the sustainable development goal advocating for the inclusivity of hernia treatment within existing healthcare programs presents a crucial avenue for addressing the disparity in funding between infectious conditions like filarial hydrocele and hernia services. Integrating hernia treatment into programs targeting other health conditions within the same individual represents a comprehensive approach to healthcare. Second, emphasizing family-centered services for women should also encompass addressing men's health needs, including hernia treatment. Third, the potential involvement of the private sector in funding hernia surgeries, complementing donor-supported hydrocele surgeries, stands as a viable solution of leveraging support from two different avenues to address co-morbidities as

they arise. A precedent set in Tanzania with Equinor's involvement in a small-scale initiative highlights the possibility of expansion through effective messaging and advocacy efforts, indicating promising opportunities for collaboration and increased support for hernia treatment initiatives. Equinor started to support the program in 2015. Since then, they have supported 1664 surgeries. Finally, there is an opportunity to see how existing national insurance schemes can be used to cover the cost of hernia surgeries (23).

4 Conclusion

In conclusion, the global burden of groin hernia and hydrocele presents a significant public health challenge, affecting millions of individuals worldwide. Elective hernia repair and hydrocelectomy are effective interventions that can prevent life-threatening complications and enhance the quality of life for affected individuals (6). The benefits of surgery far outweigh the costs (24). However, disparities in access to surgical care persist, particularly in low- and middle-income countries (LMICs) where resources are limited and surgical services are often insufficient.

The paper highlights the prevalence of hernias and hydroceles in sub-Saharan Africa, underscoring the urgent need for improved access to surgical interventions in these regions for both morbidities. Despite being neglected surgical conditions, hernias and hydroceles profoundly impact the quality of life of affected individuals, leading to significant morbidity and mortality rates.

The ethical dilemma faced by surgeons and public health practitioners in prioritizing patients for surgical interventions, particularly in the context of donor-funded hydrocele surgery camps, is evident. Hernia patients often find themselves overlooked, despite presenting with similar symptoms and suffering. This underscores the importance of addressing both hernias and hydroceles within the framework of global health initiatives, leaving no one behind.

The sustainable development goal advocating for the inclusivity of hernia treatment within healthcare programs provides a strategic opportunity to address disparities in surgical care funding. Addressing the neglected surgical conditions of hernias and hydroceles requires concerted efforts from policymakers, healthcare providers, and donor organizations to ensure equitable access to surgical interventions and leave no one behind in the pursuit of better health outcomes worldwide.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

KZ: Conceptualization, Writing – original draft, Writing – review & editing. FL: Conceptualization, Project administration, Supervision, Writing – original draft, Writing – review & editing. KK: Writing – original draft, Writing – review & editing. MM: Conceptualization, Writing – original draft, Writing – review & editing. NK: Conceptualization, Project administration, Supervision, Writing – original draft, Writing – review & editing. LA: Conceptualization, Project administration, Supervision, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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