WEST AFRICAN JOURNAL OF MEDICINE

REVIEW ARTICLE

Inguinal Hernia Disease in Africa: A Common but Neglected Surgical Condition

Les hernies inguinales en Afrique: une pathologie chirurgicale courante et négligée

M. Ohene-Yeboah, F. A. Abantanga

ABSTRACT

BACKGROUND**: Hernia surgery is one of the most frequent procedures done by surgeons – paediatric and general surgeons – in the African continent.**

OBJECTIVE: **To review the surgical literature, on the epidemiology, clinical features, treatment and outcome of inguinal hernia surgery in Africa.**

DATA SOURCE: **The search terms used were groin hernias in Africa, hernia surgery in Africa, inguinal hernias in Africa, hernias in adults and hernias in children in Africa using Medline, Cochrane Central Register of Controlled Trials and EMBASE.**

SELECTION CRITERIA: **All journal articles on inguinal hernias performed in Africa and published in the world journals from 1990–2010 were retrieved.**

DATA EXTRACTION AND ANALYSIS: **All articles containing information on inguinal hernias in children and adults were carefully studied for epidemiology, clinical presentation, method of hernia repair, complications (including morbidity and mortality rates) and the future of hernia surgery in Africa.**

RESULTS: **There was an absolute dearth of knowledge of the burden of inguinal hernias in the various communities in Africa, especially, in sub-Saharan Africa. There were non-existent population-based studies in the sub-Saharan context that could inform us about the epidemiology of inguinal hernias and hence estimate the necessity for surgery in Africa. The studies were all clinical in nature and did not reflect the true burden of the disease among Africans. In many of these hospital-based studies, the method of inguinal hernia repair used most was the Bassini repair. Not much was found in the literature about the use of the Lichtenstein tension-free mesh repair of inguinal hernias, the reason being that the mesh was too expensive for the patients to afford. Scarcely, was laparoscopic hernia repair mentioned.**

CONCLUSION: **Based on the clinical studies reviewed, there is a large disease burden of inguinal hernias in Africa. There is, understandably, also a limited surgical capacity to reduce this burden. The authors advocate the formation of an African Hernia Society to partner with corporate and international organisations to make hernias a public health problem and to attempt to determine, using population-based studies, the actual burden of the disease in Africa and then to take modern hernia surgery to most parts of the continent to help reduce the hernia burden, especially its complications. WAJM 2011; 30(2): 77–83.**

Keywords: **Inguinal hernia, sub-Saharan Africa, Complications, Herniorrhaphy, Review paper.**

RÉSUMÉ

CONTEXTE: La cure chirurgicale de hernie inguinale est une occupation fréquente du chirurgien général et du chirurgien pédiatrique en Afrique.

OBJECTIF: Effectuer une revue de la littérature et analyser les aspects épidémiologiques, la présentation clinique ; le traitement et les résultats de la cure chirurgicale des hernies inguinales en Afrique.

BASE DE DONNEES: Les recherches sont effectuées dans Medline, Cochrane Database et dans EMBASE. Les termes de recherche sont la hernie de l'aine en Afrique, la chirurgie des hernies inguinales en Afrique, hernie de l'adulte et hernie de l'enfant en Afrique.

CRITERES DE SELECTION: Tous les articles réalisés en Afrique sur les hernies inguinales et publiés dans les différents journaux du monde de 1990 à 2010 sont analysés.

RECCUEIL ET ANALYSE DES DONNEES: Tous les articles contenant des informations sur les hernies inguinales de l'adulte et de l'enfant sont analysés en particulier dans les aspects épidémiologiques, la présentation clinique, le type de traitement, les complications (incluant la morbidité et de mortalité), et les résultats des cures chirurgicales.

RESULTATS: Cette étude a révélé qu'il existe une rareté des données dans la prise en charge des hernies dans les différentes communautés notamment en Afrique sub-saharienne. Il n'existe pas de base de données propre en Afrique subsaharienne pouvant informer sur l'épidémiologie des hernies inguinales et les différentes indications de la cure chirurgicale. Les études sont tous cliniques et ne reflète pas la problématique de la maladie herniaire en Afrique. Dans la plupart des séries, la cure chirurgicale était réalisée selon le procédé de Bassini et très peu de série ont utilisé le procédé de cure sans tension de Lichtenstein. La raison principale évoquée est le cout élevé des prothèses qui ne sont pas accessible aux patients. Le traitement laparoscopique est à peine mentionné dans les études.

CONCLUSION: Cette revue de la littérature montre clairement qu'il existe une insuffisance des données sur les hernies inguinales en Afrique. Il n'existe paradoxalement pas de volonté des chirurgiens pour résoudre le problème. Les auteurs préconisent la création de sociétés savantes africaines sur les hernies et le développement de partenariats avec les organisations internationales pour faire des hernies un problème de sante public. Les nouvelles bases de données permettront de cerner la problématique des hernies inguinales en Afrique, de rendre accessible les techniques modernes de traitement des hernies et d'améliorer la prise en charge des complications. **WAJM 2011; 30(2): 77–83.**

Mots Cles: hernie inguinale, Afrique sub-saharienne, chirurgie, complications, herniorraphie, revue de la littérature.

Department of Surgery, Komfo Anokye Teaching Hospital, School of Medical Sciences, Kwame Nkrumah University of Science and Technology, University Post Office, Kumasi, Ghana.

Corespondence: **Michael Ohene-Yeboah,** E-mail: mikeoheneyeboah@yahoo.co. uk.

Abbreviations: DALYs, Disability Adjusted Life Years.

INTRODUCTION

The burden of disease and the associated mortality in Africa especially in sub-Saharan Africa is enormous. According to WHO estimates infections, infestations, communicable diseases and maternal causes account for most deaths in Africa (Table 1).[1,2] The importance of non-communicable diseases as causes of death in Africa is much less highlighted. In published data on causes of death in Africa, non communicable diseases are often lumped together and documented as "other cause of death" (Table 1).[1] Death from surgical diseases would be documented as death from "other causes". The inadequate documentation of surgical diseases has led to a situation where the need for both preventive and emergency surgical care is simply ignored.[3] Inguinal hernia is one such common surgical disease that is ignored in most of Africa. Numerous deaths occur almost daily in remote rural communities across Africa due to lack of adequate surgical care for inguinal hernia disease.[4]

Inguinal hernia repair surgery is one of the most frequently performed surgical procedures worldwide. It is estimated that more than 20 million inguinal hernias are repaired every year around the world; specific rates by country vary from 100 to 300 per 100 000 population per year.[5] Due to poor documentation the hernia surgery output from Africa is unknown.[3–4] Estimates indicate that of the average need of 175 inguinal hernia repairs per 100 000 population per year, only 25 are actually performed and of 30 estimated need for emergency hernia surgery only three to four are carried out.[4] Thus in many communities across Africa there are large accumulated pools of untreated inguinal hernias that have been overlooked. Many patients with long standing untreated hernias die each year from strangulation and intestinal obstruction without the benefit of surgical intervention.[6–7]

Worldwide inguinal hernia repair surgery is emerging from the twin challenges of laparoscopic and tension-free repair techniques.[8] These repair methods have come to replace the traditional suture repairs of Bassini and McVay in many developed nations.[8] In Africa where the hernia disease burden is very high, the most appropriate repair technique is yet to be decided. This is due to the fact that there is inadequate clinical and epidemiological data to inform surgeons working in Africa on the most appropriate repair procedure. This paper is a review of the surgical literature on the epidemiology, presentation, treatment and outcome of inguinal hernias – the most common type of hernia[9] – published from Africa over the past two decades: from 1990 to 2010. A few publications before 1990, relevant to the review, have been included. The purpose of this review is to highlight available epidemiological and clinical data that may inform decisions and efforts needed for the appropriate action to reduce the hernia disease burden in Africa. Strategies to raise inguinal hernia disease to the status of a priority public health issue are outlined. This has become necessary as the need to step up hernia surgery output in most African countries can no longer be ignored.

METHODS

A review of the literature for published articles in English language from Africa on inguinal hernias was conducted. The period of review was from 1990 to 2010. A Medline, The Cochrane Central Register of Controlled Trials and Embase search with the key words *hernia in Africa / inguinal hernia in Africa/ inguinal hernia in adults and children in sub-Saharan Africa or inguinal hernia in x;* where x included all English and most French speaking countries of Africa south of the Sahara yielded some 150 abstracts and citations. The WHO sponsored network for access to publications on health – the Health InterNetwork Access to Research Initiative (HINARI), the African Journal On Line (AJOL) access to medical research facilities and the Ptolemy Project of University of Toronto were then used to locate articles that contained information on the epidemiology, clinical presentation, treatment and outcome of inguinal hernias in Africa. Further references were obtained through cross-referencing the bibliography cited in each work. A few studies published from outside Africa before 1990 but which had direct relevance to inguinal hernia in Africa were included in the review.

RESULTS

Incidence

The exact incidence/and or prevalence of inguinal hernia in Africa is unknown. Over two decades ago Nordberg working as the medical director at the African Medical and Research Foundation in eastern Africa recorded statistics for surgical output including numbers of operations by surgical disease over a period of three years, 1979–1981, from 10 rural hospitals in Kenya, Tanzania, southern Sudan and Ethiopia. Using the rates of major operations in these hospitals he estimated the incidence of inguinal hernia in need of repair at 175 per 100 000.[4] Using standard and well documented public health methods of population studies Yardanov and Stoynov determined that 16% to over 30% of the population in Tanzania in East Africa have inguinal hernia;[10] with similar methods Belcher and his colleagues calculated that 7.7% of the adult population in southern Ghana, West Africa have inguinal hernia.[11] These figures need updating as the population of most African communities has increased over the years. Nonetheless, the figures indicate the size of the challenge as it is clear that there is a high prevalence of inguinal hernias in Africa.

Age and Sex Distribution

In a recent report on the epidemiology of external hernias in Ghana, Ohene-Yeboah and his colleagues analysed over 2000 external hernias on the basis of the anatomic site, age and sex. One in five of inguinal hernias occurred in boys aged four years or less, fewer inguinal hernias were seen in ages 5 to 15 years, and the numbers of inguinal hernia increased sharply after the age 20 years. These inguinal hernias were two times more on the right than on the left and 10 times more frequent in men.[9]

Burden of Disease

The incidence and prevalence figures of inguinal hernia in Africa as presented above represent only part of the story of hernia in Africa. In a prospective cohort study by the Plymouth Hernia Service group, 106 UK and 135 Ghanaian adult patients admitted for local anaesthetic day case inguinal hernia

repair were compared. These investigators found that ninety or 67% of the Ghanaian hernias extended into the scrotum compared with 7 or 6.0% of the UK hernias. In addition the Ghanaian hernias were significantly larger (p = 0.01); 16% of Ghanaian patients were unable to work due to the hernia and in a further 87 or 64%, the hernias had been present for over a year.[12]

Mortality Associated with Hernia

Uncomplicated inguinal hernia disease

Statistics on disease mortality are particularly sparse in Africa. Less than 1% of the population is covered by accurate death registration systems. In sub-Saharan Africa there is no country that has data of sufficient quality for the estimation of national mortality rates.[13] For an anatomic disease that is easily accessible for diagnosis and a potential for a complete cure if treated early, inguinal hernia mortality should be zero. The safety of surgery for uncomplicated inguinal hernia in both adults and children was highlighted in two recent reports from Nigeria. From Jos in the middle belt of Nigeria researchers Ramyil and his colleagues reported on the outcome of inguinal hernia surgery in a randomized prospective study involving 121 patients. One-half of their study population was randomized for day case surgery and the other half for inpatient care.[14] The results showed fewer postoperative complications in the 61 patients that received day care surgery as compared with the 60 patients that were treated as inpatients (p=0.002). From South Western Nigeria, Usang and his fellow workers documented their experience with day case inguinal hernia surgery in children. The result of the study on 88 patients confirmed the safety of inguinal hernia day care surgery in children with only 4.8% of wound infections recorded.[15] In both studies there were no mortalities. In rural communities where the level of expertise and hence the standard of surgical care is low the results of inguinal hernia surgery are not always satisfactory[16]. One published clinical study from Senegal reported a postoperative complication rate of 21% after surgery for 100 uncomplicated inguinal hernias.[17] These complications included injuries to the urinary bladder. Even though there were no mortalities in this series injury to the bladder- as a post operative complication - could keep a farmer off his farm for the entire planting season with serious economic effect on the family.

Table 1: Estimated Percentages of Death by Cause, 2002

Cause	World	Africa
No. of deaths (all causes)	57,029,000	10,664,000
Infections and parasitic diseases, excluding HIV/AIDS, respiratory infections	7.3	22.6
HIV/AIDS	4.9	19.6
Respiratory infection	6.9	10.5
Maternal and perinatal causes	5.2	7.4
Cancer	12.5	3.8
Cardiovascular diseases	29.3	9.7
Injuries, violence	9.1	7.0
Other causes	24.8	19.4

Source

Table 2: Inguinal Hernia Mortality in some Communities in Africa

Author(s)	Country	Year	Mortality %
Adesunkamni *et al*[20]	Nigeria	2000	2.7
Haruna *et al*[21]	Niger	2000	40.0
McKonkey[23]	Sierra Leone	2002	11.1
Ohene-Yeboah[18]	Ghana	2003	6.2
Odula *et al*[19]	Uganda	2004	0.48
Mba[22]	Nigeria	2007	5.3

Complicated Inguinal Hernia Disease

It is a fact of life in Africa that many young men die every year from complicated or strangulated inguinal hernia.[4] The mortality figures vary from country to country (Table 2). However any level of mortality from inguinal hernias that strangulate is unacceptable. In a retrospective study from Nigeria, Mbah concluded that complicated inguinal hernias and their emergency treatment are associated with increased mortality in our environment. Of the complicated hernias admitted to hospital 20% died with or without surgery. The author therefore recommends prophylactic elective herniorrhaphy as a safeguard against complications.[22] In a prospective descriptive study of groin hernias in Mulago Hospital, Kampala, 106 (54.5%) out of 195 inguinal hernias were strangulated at the time of admission with significant complication developing in 87 (41.8%) of the cases with one death.[19]

Clinical Presentation of Inguinal Hernia in Africa

Inguina Hernia in Children

There is a lack of information on inguinal hernia disease in children from most of Africa especially sub-Saharan Africa. This is because more efforts are directed towards the control of non-surgical childhood diseases such as malnutrition and infectious diseases.[24–25] Recently published clinical studies provide some evidence that inguinal hernia disease in children usually presents for elective surgery. From a referral hospital in Ghana, researchers Abantanga and Amaning compiled a list of over a thousand (1200) elective surgical conditions seen in patients aged between 0 and 14 years over a period of four years.[26] Inguinal hernia accounted for nearly half (511) or 42.58% of the elective surgical conditions identified. Inguinal hernia was the most common congenital anomaly in these children. In a related study Abantanga investigated groin and scrotal swellings that presented and were treated as elective cases in children aged 5 years and below. A total of 396 inguinal hernias were identified out of the 535 cases indicating that over two-thirds (74%) of all groin and scrotal swellings operated on as elective surgery in this hospital were inguinal hernias.[27] These were all uncomplicated hernias.

Although most published data indicate that inguinal hernias in children present mostly as elective cases, an occasional child may require an emergency admission for inguinal hernia surgery. Ameh working in Zaria northern Nigeria reported on 18 children aged below two years who were managed for

incarcerated and strangulated inguinal hernias over a period of 10 years. The overall strangulation rate was 4.8% with less than two children a year requiring an emergency repair.[28] Irabor in a period of 30 months saw only 3 children with obstructed inguinal hernias[29] whilst Uba and coworkers[30] saw only 6 strangulated hernias in 5 years requiring emergency surgery. As a congenital anomaly inguinal hernias need to be repaired as soon as diagnosed. Adherence to this principle avoids the presentation of inguinal hernia as an extreme complication as documented in two infants and reported from Zaria.[31]

Inguina Hernia in Adults

The clinical presentation of inguinal hernia in adults in Africa demonstrates the severity of hernia disease in our communities which in turn is a reflection of the effects or consequences of neglecting a very common surgical condition. Recently The Plymouth Hernia Service Group compared African and European inguinal hernias and highlighted the increased morbidity associated with Ghanaian (the African) hernias that are often large and very longsatnding.[12] Another major difference between European and African inguinal hernias is the manner in which inguinal hernias in adults present to hospital in Africa. Clinical studies published from Ghana, Sierra Leone, Uganda, and Nigeria all report that a large proportion of inguinal hernias in adults present to hospital as emergencies. Many more hernia repairs are done as emergency operations – 65% in Ghana, 76% in Uganda, 33% in Sierra Leone, and 25% in Nigeria – than as elective repair.[9,18–20,23] In some rare circumstances, the strangulated hernia is neglected leading to an unusual presentation as an entero-scrotal fistula.[22,32] Emergency presentation is often associated with increased morbidity and mortality.[18–23]

Over the last decade researcher Adesunkanmi and his colleagues working at Ile Ife in southwestern Nigeria reported on the clinical features of inguinal hernias in a large number of patients from the surrounding urban and semi-urban communities.[33] In their 2004 publication they reported on 425 adult patients presenting at the Teaching Hospital with inguinal hernias. Many of these adults (over 60%) were either farmers or engaged in some agricultural activity in addition to whatever they did for a living. The inguinal hernias, as in most other communities[9] were seen mostly in men 391(92%) and were present from early adulthood (16 years) to ripe old age (90 years). Most of the inguinal hernias were for up to 25 years, were indirect (86.5%), on the right side (53.2%) and in 169 patients (39.8%) the inguinal hernia had descended into the scrotum. These clinical features indicate that these were neglected childhood congenital inguinal hernias that had been carried on to adulthood. In less than 10% of the patients the inguinal hernias were bilateral (9.4%) or recurrent (3.5%). In addition to the usual symptoms of inguinal hernia, nearly a third (29%) of the patients presented with symptoms and signs of hernia complication including abdominal pain, irreducible hernia, and sometimes tenderness. A smaller proportion (22.6%) of the patients – mostly men aged over 50 years – complained of symptoms of lower urinary tract obstruction.

These same investigators had earlier on provided some clinical information on the presentation of inguinal hernias in patients aged 50 years and over.[34] Nearly all (90%) of the 250 patients studied were men with almost one-half (49.6%) of the inguinal hernias on the right side and a third (31.2%) had descended into the scrotum. The challenge in this sub group of inguinal hernia patients is that half (51.2 %) had – over the years that they had lived with the hernias – acquired associated diseases including lower urinary tract obstruction (24.8%) and cardiopulmonary disease (19.6%). These associated diseases subsequently influenced the outcome of eventual repair making surgery more risky than would have been. In Africa inguinal hernia presents with complications or as an emergency from strangulation or obstruction.

Treating inguinal hernia in Africa.

Bassini Repair

Available data from published clinical studies indicate that there has not been any change in the surgical treatment of inguinal hernias in Africa over several decades. Connell serving in the colonial East African Medical Service 80 years ago reported on the treatment of 142 right and 63 left inguinal hernias. In the typical manner of the times Connell described the Bassini technique that he used to repair these inguinal hernias, pointing out that he was in agreement with his friend Gallie that it made no difference whether he sutured the conjoint tendon to the Poupart's ligament in front or behind the cord.[35] Publications from Africa that describe the Bassini repair or any of the other suture methods in sufficient detail are scanty. However, most publications from Africa indicate that the inguinal hernia repair technique that was most commonly used across the continent has been the Bassini and much less frequently – the MacVay and Nylon Darn techniques.[14,17–20,33] Ball and his fellow investigators in Senegal recently compared complications of treatment of adult groin hernias using the Bassini and MacVay's techniques[17] and in their comprehensive discussion of the determinants of outcome of inguinal hernia repair in Nigerian patients, Adesunkanmi and fellow investigators performed the Shouldice repair in nearly half of the 425 inguinal hernias.[33] Although from the perspective of the developed world the Bassini repair no longer satisfies the requirements of satisfactory hernia surgery[36,37] it remains the standard in Africa.[16,19,33,34] This situation is a direct consequence of years of persistent under funding and inadequate health infrastructure development leaving the health systems of most African countries weak and unable to provide for the required improvements in any aspect of the surgical needs of the people, including inguinal hernia repair.[38]

General Anaesthesia for Inguina Hernia Repair

Available information from published clinical studies indicates that African surgeons prefer to use general or spinal anaesthesia to perform the Bassini repair even for elective cases. Wilhelm and his colleague investigators reviewed the operative theatre notes in

seven hospitals in the Northern region of Ghana over a period of one year. Limiting their study to elective repairs only these researchers found that for the 1172 inguinal hernia repairs performed, spinal anaesthesia was used in 498 (48.0%), general anaesthesia in 307 (29.6%), and local anaesthesia in 233(22.4%). Also of the 120 bilateral inguinal hernias repaired, 50% were repaired under general anaesthetic.[39] However, visiting surgeons from Europe used local anaesthetic more often than the African counterparts: 27.7% to 15.6%.[8] In a series of 121 elective inguinal hernia repairs performed in Jos, Nigeria, Ramyil and his colleagues reported that local anaesthesia was used in 50 patients whiles general anaesthetic was used in 71 patients.[14] Adesunkanmi and co-workers, whilst investigating the determinants of outcome of inguinal herniorrhaphy in 425 Nigerian patients reported that general anaesthesia was used almost as frequently as local anaesthesia: 194 (45.6%) versus 214 (50.4%), and only 17 (4%) patients had spinal anaesthesia.[33] There is no report of any randomized clinical trial on the most appropriate anaesthetic method suitable for inguinal hernia repair in Africa. However while there is no question as to the use of general anaesthetic for emergency repairs when dealing with strangulated inguinal hernia, studies from both inside and outside Africa have reported the safety and effectiveness of local anaesthesia in elective repair of primary inguinal hernias.[39,40]

The Outcome of Surgery for African Inguinal Hernias

There are very few reported studies on the outcome of inguinal hernia repair in Africa. Most clinical series have reported their postoperative mortality and morbidity especially after emergency operation for strangulated hernias (Table 2). Ramyil and his colleagues in a study to evaluate the safety of day care elective inguinal hernia repair in Jos used early postoperative complications as the outcome measure and reported 17 such complications: 22 wound complications with an overall wound infection rate of 7.79%.[14] There was no mortality in this series. Ball and his colleagues recently reported the poor outcome of surgery for uncomplicated inguinal hernia from Senegal following the of treatment of adult groin hernias using the Bassini and MacVay's techniques.[17] The post-operative complication rate in their series was 21% and included very serious complications such as injuries to the urinary bladder.

Much more informative is the study by Adesunkanmi and his colleagues in Ile Ife to document the factors that influence a favourable or unfavourable outcome after inguinal hernia surgery. A number of postoperative complications were documented. These included scrotal complications such as oedama and heamatoma as well as scrotal sac infection and necrosis. Wound complications were also frequent and included wound infection and dehiscence. Postoperative outpatient attendance was poor as 298 patients were lost to follow up in 6 months and only 17 patients attended the out-patient for more than 2–5 years. The inguinal hernia recurrence rate of 4% is unlikely to be reliable. The length of hospital stay and hence the ability of patients to return to their farms was 4 days in elective cases and 7 days after emergency operations. As documented in this and other studies[17] the outcome of inguinal hernia surgery in most of Africa is poor with high rates of wound infection, scrotal and other complications leading to prolong and costly hospital stay. Keeping farmers away from the farms simply means no food. As pointed out by Adesunkanmi the common factor to the poor surgical outcome is the underlying tissue weakness resulting from long periods of attenuation by voluminous longstanding inguinal hernias. This is a further testimony of the severity of the inguinal hernia disease in Africa. In the long term chronic groin pain and hernia recurrence are the most important outcome measures.[36] However there are no studies from Africa on these complications just as there is no information on patient-centered outcomes or patient satisfaction probably due to the fact that follow up on African patients is often very poor.

Interventions are needed

This is a brief review that highlights the paucity of published data on inguinal hernia in Africa. More studies (clinical and basic research) are required to provide the evidence for the necessary changes in policy on inguinal hernia disease and in the practice of inguinal hernia surgery in Africa. The burden of inguinal hernia disease can be reduced with the requisite changes in the healthcare systems of most African countries. It is a fact that hernia surgery has seen many advances in technique over the past few decades and surgeons in developing countries are often not exposed to these due to lack of resources.[41] Published data from Europe and the United States indicate that the use of prosthetic materials for the repair of inguinal hernias gives the best results.[8,42,43] These mesh repair techniques are not available in Africa for routine use[16,33] as they are considered to be expensive and hence not cost-effective. Two recent publications from Burkina Faso[44] and Ghana[45] on the use of nylon mosquito net mesh as an alternative to the high cost commercial mesh repair provide some hope for the large numbers of Africans with long-standing inguinal hernias. Freudenberg and his fellow researchers found neither mesh rejections, nor complications nor grade 1 infection among 20 patients who received mosquito nylon mesh compared with a cohort of patients who were treated with UltraPro commercial mesh in Burkina Fasso.[44] Similarly, in Ghana wound complications occurred in less than 10% of 95 patients who were operated upon by both Ghanaian and European surgeons using polyester mosquito net mesh.[45] The hernia recurrence rate was zero at 6 months. Recently, the open mesh repair for inguinal hernia was introduced to the Western part of Ghana with the establishment of the first ever African Hernia Centre.[46] Each year a group of European Surgeons joins their Ghanaian counterparts to perform inguinal hernia repairs at a rate of about 50 hernias per month.[47] Indications are that this method of repair is acceptable to both patients and surgeons. However more studies need to be done to provide first class evidence for the most appropriate repair technique for African inguinal hernias. In a recent clinical trial from Cameroun,

Maggiore and his colleagues compared the results obtained with 381 Bassini and 357 Lichtenstein repairs of inguinal hernias over a period of four years.[48] They concluded that both repair techniques were technically valid and recommended the Bassini procedure for young patients (40 years or less) and the Lichtenstein for the repair of hernias in older patients 40–45 years or over.

In an excellent review of hernia surgery in Africa using recent evidence from the Operation Hernia work in Ghana where 86% of inguinal hernia repairs are done with polyester mosquito net mesh, Kingsnorth and his colleagues determined the cost effectiveness of these hospital-based interventions.[49] Using standard methods of cost effective analysis and the concept of Disability Adjusted Life Years (DALYs) these investigators put up a strong case for hernia disease to be considered a public health issue. This change in health policy is necessary if the hernia disease burden is to be addressed and must be considered by policy makers across the entire continent. Change is also required in the healthcare systems of most, if not all, African countries to accept to replace the Bassini method of repair of hernias with the mesh repair and to encourage the use of local anaesthesia in all hospitals. These changes are likely to take some time to become fully established and hence some advocacy and persistent persuasion of policy makers is needed.

Advocacy and Sustainability

Any effort to address the burden of inguinal hernia disease in Africa must consider the challenge of how to sustain enough interest over a long period of time as it will take years to reduce the accumulated numbers of inguinal hernias following years of neglect. Interest in the disease and its treatment will have to incorporate several aspects including research, health education, training of personnel and surgical capacity building, outreach activities, financing and international co-operation. National governments have a role in facilitating these activities. However African surgeons have to accept some responsibility for the development of interest in the disease, encouraging and monitoring progress in reducing the burden of hernia in their respective countries. A hernia society or congress for Africa – along the lines of the European, American[50] and recently the Asia-Pacific Hernia Societies – where African surgeons interested in the diagnosis and treatment of inguinal and other types of hernias can come together, will be needed. The function of such an organized body, among others, will be to advocate for sustained efforts at elective hernia repairs. In addition, the committed efforts of such an organization are likely to contribute immensely by providing the platform for interacting with politicians and policy makers, identifying and directing research, organizing outreach services for hernia repairs and seeking corporate and international collaboration and funding. The high point of attainment is to get the policy makers to elevate hernia (and surgical) disease to the level of a public health issue, as advocated by Weiser TG and colleagues[13] and Bickler SW *et al,*[51] and recognize hernia surgery as a public health priority: moving away from the current notion that not enough infrastructure, human resources or financing capacity are available for the effective provision of hernia services.[36]

Conclusion

This short review has highlighted the challenges of inguinal hernia disease in Africa. There is a large disease burden associated with considerable morbidity and mortality. Surgical and financial capacity needed to reduce the hernia disease burden is limited. Surgical partnerships and collaborations with well-endowed countries with advanced healthcare systems have the potential to assist in addressing some of these challenges. Above all, African health care systems must be willing to change in the direction of a commitment to reduce the inguinal hernia disease burden by expanding the services needed for a sustained campaign at mass elective repair of inguinal hernias.

REFERENCES

1. The World Health Report 2004 Changing History. Geneva: WHO.
2. Mathers CD, Fat DM, Inoue M, Rao C, Lopez AD. Counting the Dead and What They Died From: An Assessment of Cause of Death Data. Bullentin of the *World Health Organization.* 2005; **83:** 171–177.
3. Norberg E, Mwobobia I, Muniu E. Major and minor surgery output at district level in Kenya: Review and issues in need of further research. *Afr J Health Sci* 2002; **9:** 17–25.
4. Norderg ER Incidence and estimated need of caesarean section, inguinal hernia repair, and operations for strangulated hernia in rural Africa. *BMJ.* 1984; **289:** 92–93.
5. Bay-Nielsen M, Kehlet H, Strand L, Malmstrøm J, Andersen F, Wara P *et al.* Quality assessment of 26,304 herniorrhaphies in Denmark: a prospective nationwide study. *Lancet* 2001; **358:** 1124–28.
6. Roy AD. Surgical care in the village. *Proc R Soc Lond* 1980; **209:** 147–51.
7. Ohene-Yeboah M, Addipah E, Gyasi – Sarpong K. Acute intestinal obstruction in adults in Kumasi Ghana. *Ghana Med J.* 2006; **40:** 50–54.
8. Kingsnorth AN, LeBlanc KA. Hernias: inguinal and incisional. The Lancet. 2003; **362:** 1561–1571.
9. Ohene-Yeboah M, Abantanga F, Oppong J, Togbe B, Nimako B, Amoah M, *et al.* Some aspects of the epidemiology of external hernias in Kumasi, Ghana. *Hernia.* 2009; **13:** 529–532.
10. Yardov YS, Stoyanov SK. The incidence of hernia on the island of Pemba. East Afr Med J. 1969; **46:** 687–691.
11. Belcher DW, Nyame PK, Wurapa FK. The prevalence of inguinal hernia in adult Ghanaians males. *Trop Geogr Med* 1978; **30:** 39–43.
12. Sanders DL, Porter CS, Mitchell KCD, Kingsnorth A. A prospective cohort study comparing the African and European hernia. *Hernia.* 2008; **12:** 527–529.
13. Weiser TG, Regenbogen SE, Thompson KT, Haynes AB, Lipsitz SR, Berry WR *et al.* An estimation of the global volume of surgery: a modeling strategy based on available data. Lancet 2008; **372:** 139–144.
14. Ramyil VM, Iya D, Ogbonna BC, Dakum NK. Safety of daycare hernia repair in Jos, Nigeria. *East Afr Med J.* 2000; **77:** 326–328.
15. Usang UE, Sowande OA, Adejuyigbe O,Bakare TIB, Ademuyiwa OA. Day case inguinal hernia surgery in Nigerian

children: Prospective study. *Afr J Pead Surg*. 2008; **5:** 76–78.
16. Archampong EQ. Surgery in developing nations. *Br J Surg* 2006; **93:** 516–517.
17. Fall B, Betel ME, Diarra O, Ba M, Dia A, Diop A. Complications of treatment of adult's groin hernia: a report of 100 cases comparative study between Bassini and MacVay's techniques. *Dakar Med.* 2005; **50:** 37–40.
18. Ohene-Yeboah M. Strangulated external hernias in Kumasi Ghana. *West Afr. J. Med.* 2003; **22:** 310–313.
19. Odula PO, Kakande IM. Groin hernia in Mulago Hospital, Kampala. *East & Central Afr J Surg*. 2004; **9:** 48–52.
20. Adesunkanmi ARK, Agbakwuru EA, Badmus TA. Obstructed abdominal wall hernia at the Wesley Guild Hospital, Nigeria. *East Afr Med J*. 2000; **77:** 31–33.
21. Haruna Y, Yaya H, Abdou I, Bazira L. Prognosis of strangulated inguinal hernia in the adult: influence of intestinal necrosis. A propos of 34 cases. *Bull Soc Pathol Exot.* 2000; **93:** 317–320.
22. Mbah N. Morbidity and mortality associated with inguinal hernia in northwest Nigeria. *West Afr J Med.* 2007; **26:** 288–292.
23. McConkey SJ. Case series of acute abdominal surgery in rural Sierra Leone. *World J Surg*. 2002; **26:** 509–513.
24. Ameh EA. Chirdan LB. Paediatric surgery I, the rural setting: Prospect and feasibility. *West Afr J Med.* 2002; **20:** 52–55.
25. Abantanga FA. Mock CN. A survey of paediatric trauma in Kumasi, a hospital-based study. *Ghana Med J*. 1998; **32:** 977–980.
26. Abantanga FA, Amaning EP. Paediatric elective surgical conditions as seen at a referral hospital in Kumasi, Ghana. *ANZ Surg* 2002; **72:** 890–892.
27. Abantanga FA. Groin and scrotal swellings in children aged 5 years and below: a review of 535 cases. *Pediatr Surg Int.* 2003; **19:** 446–450.
28. Ameh EA. Incarcerated and strangulated inguinal hernias in children in Zaria, Nigeria. *East Afr Med J*. 1999; **76:** 499–501.
29. Irabor DO Hernia repair under local or intravenous Ketamine in a tropical low socio-economic population. *WAJM*. 2005; **24:** 143–146.
30. Uba AF, Edino ST, Yakubu AA, Sheshe AA. Childhood intestinal obstruction in Northwestern Nigeria. *WAJM*. 2004; **23:** 314–318
31. Ameh EA, Awotula OP, Amoah J. Spontaneous scrotal faecal fistula in an infant. *Pediatr Surg Int.* 2002; **18:** 524–525.
32. Ohene-Yeboah M. Entero-scrotal fistula in a Ghanaian adult: a case report of the spontaneous rupture of a neglected strangulated inguinal hernia. Hernia DOI 10.1007/s10029-010-0672-1.
33. Adesunkanmi ARK, Badmus TA, Ogundoyin O. Determinants of outcome of inguinal herniorrhaphy in Nigerian patients. *Ann Coll Surg H K.* 2004; **8:** 14–21.
34. Adesunkanmi ARK, Badmus TA, Salako AA. Groin hernias in patients 50 years of age and above pattern and outcome of management in 250 consecutive patients. *West Afr J Med* 2000; **19:** 142–147.
35. Connell WK. Hernia in Africa. *Br J Surg* 1930; **18:** 16–19.
36. Kingsnorth AN. Treating inguinal hernias. *BMJ* 2004; **328:** 59–60.
37. Kingsnorth AN, Bowley DMG, Porter C. A prospective study of 1000 hernias: results of the Plymouth Hernia Service. *Ann R Coll Surg Engl* 2003; **85:** 18–22.
38. World Health Organization per capita Health care expenditures, 2004. Geneva, Switzerland: World Health Organization. URL:http//www.who.int/en,
39. Wilhelm TJ, Anemana S, Kyamanywa P, Rennie J, Post S, Freudenberg S. Anaesthesia for elective hernia repair in rural Ghana – appeal for local anaesthesia in resource – poor countries. Trop Doct 2006; **36:** 147–149.
40. Nordin P, Zetterstrom H, Gunnarsson U, Nilsson E. Local, regional, or general anaesthesia in groin hernia repair: multicentre randomized trial. *Lancet* 2003; **362:** 853–858.
41. Courtney CA, Duffy K, Serpell MG, O'Dwer PJ. Outcome of patients with severer chronic pain following repair of groin hernia. *BJS* 2002; **89:** 1310–1314.
42. Lichtenstein IL, Shulman AG, Amid PK *et al.* The tension free hernioplasty. *Am J Surg*. 1989; **157:** 188–193.
43. Neumayer L, Gobbie-Hurder A, Jonasson O, Fitzgibbons R, Dunlop D, Gibbs J *et al.* Open mesh versus laparoscopic mesh repair of inguinal hernia. *N Engl J Med.* 2004; **350:** 1819–1827.
44. Freudenberg S, Sano D, Ouangré E, Weiss C, Wilhelm TJ. Commercial mesh versus nylon mosquito net for hernia repair. A randomized double-blind study in Burkina Fasso. *World J Surg.* 2006; **30:** 1784–1789.
45. Clarke MG, Oppong C, Simmermacher R, Park K, Kurzer M, Vanotoo L *et al* The use of sterilized polyester mosquito net mesh for inguinal hernia repair in Ghana. *Hernia.* 2008; **13:** 155–159.
46. Kingsnorth AN, Oppong C, Akoh J, Stephenson B, Simmermarcher R. Operation hernia to Ghana. *Hernia* 2006; **10:** 376–379.
47. Sanders DL, Kingsnorth. Operation hernia: humanitarian hernia repairs in Ghana. *Hernia* 2007; **11:** 389–391.
48. Maggiore D, Muller J and Hafanaki J. Bassini vs Lichtenstein: two basic techniques for inguinal hernia treatment. *Hernia* 2001; **5:** 21–24.
49. Kingsnorth AN, Clarke MG, Shillcutt SD. Public health and policy issues of hernia surgery in Africa. *World J Surg* 2009; **33:** 1183–1193.
50. Wantz GE. The American Hernia Society. *Hernia* 1997; **1:** 3.
51. Bickler, Spiegel DA. Global surgery – defining a research agenda. *Lancet* 2008; **372:** 90 – 92.