The use of mesh for inguinal hernia repair in northern Ghana

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ABSTRACT

Background: Despite the recognition that inguinal hernia (IH) repair is cost-effective, repair rates in low- and middle-income countries remain low. Estimated use of mesh in low- and middle-income countries also remains low despite publications about low-cost, noncommercial mesh. The purpose of our study was to assess the current state of IH repair in the northern and transitional zone of Ghana.

Materials and methods: A retrospective review of surgical case logs of IH repairs from 2013 to 2017 in 41 hospitals was performed. Multivariate logistic regression was used to determine predictors of mesh use.

Results: Eight thousand eighty male patients underwent IH repair. The range of IH repair in each region was 96 to 295 (overall 123) per 100,000 population. Most cases were performed at district hospitals (84%) and repaired nonurgently (93%) by nonsurgeon physicians (66%). Suture repair was most common (85%) although mesh was used in 15%. The strongest predictor of mesh use was when a surgeon performed surgery (odds ratio [OR] 3.13, $P < 0.001$), followed by surgery being performed in a teaching hospital (OR 2.31, $P < 0.001$). Repair at a regional hospital was a negative predictor of mesh use (OR 0.08, $P < 0.001$) as was the use of general anesthesia (OR 0.40, $P = 0.001$).

Conclusions: Most IH repairs are performed in district hospitals, by nonsurgeon physicians, and without mesh. Rates of repair and the use of mesh are higher than previous estimates in Ghana and Sub-Saharan Africa but not as high as high-income countries.

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Introduction

Surgical conditions are a major source of disease burden globally. Historically, efforts in public health have focused on communicable diseases while the presumed high cost of surgery has dampened efforts to address conditions likely to require surgery.[1] More recently, some selected surgical procedures, including inguinal hernia (IH) repair, have been demonstrated to be cost-effective. The cost-effectiveness of IH repair rivals such public health investments such as insecticide-treated bed nets for malaria, antiretroviral therapy for HIV, and observed therapy for tuberculosis.[2] Due to the relatively high public health burden and low cost of repair, IH repair has been recognized as being among the highest priorities for surgical conditions.[3] Therefore, ensuring accessibility of IH repair should be a priority in the development of health policy.

Despite the recognition that IH repair is cost-effective, there persists an unmet need in low- and middle-income countries (LMICs). Repair rates in high-income countries (HICs) range from 130-260 per 100,000 people[4] while rates are a quarter of this in Sub-Saharan Africa[5] and estimated to be half (56 per 100,000 people) in Ghana.[6] Low rates of repair have been noted to lead to large, painful hernias in young men who would otherwise contribute to economic development.[7] This is especially impactful in LMICs, where dependence on manual labor is common. More than 63% of patients in Ghana presenting for elective IH repair reported limitations in occupational and daily activities.[8] Untreated hernias may also present emergently as incarcerated, obstructed, or strangulated, leading to increased morbidity, mortality, and an additional burden on the health care system. In 2003, an estimated 65% of IH repair in Kumasi, Ghana, were performed emergently.[9] Given the burden of disease in Ghana and current rates of repair, an estimated backlog of one million IH needing repair would develop between 2012 and 2022.[10] Therefore the scaling up of IH repair in Ghana is essential.

It is not enough to offer treatment, but it is critical to provide safe, effective surgical care. Tension-free repair using synthetic mesh has long been the gold standard for the repair of IH. Multiple randomized controlled trials and meta-analysis have consistently demonstrated lower recurrence and less pain with mesh repair.[11] Despite these benefits of tension-free mesh repair, mesh is only used in an estimated 5% of cases in Africa, likely due to cost or unavailability.[12] Alternative low-cost mesh, such as sterilized mosquito net, has been made available for as little as $2 per piece.[8] Furthermore, several studies have shown equivalent outcomes to commercial mesh for patients undergoing repair with sterilized mosquito net mesh.[8,13-15] Despite the noninferiority of this low-cost alternative, little is published regarding the adoption of this technology in low-resource settings.

Northern Ghana is sparsely populated and has persistently been the poorest area in the country with the worst access to surgical services.[16] The purpose of this study is to assess the current state of IH repair in the northern and transitional zones of Ghana, with a focus on the Upper East Region (UER), Upper West Region (UWR), Northern Region (NR), and Brong-Ahafo Region (BAR). This research will help identify baseline rates of IH repair and mesh repair. This study may serve as a foundation for targeted efforts to expand access to effective IH repair.

Material and methods

A retrospective manual review of surgical case logs and operative reports from 41 hospitals in the UER, UWR, NR, and BAR of Ghana from January 2013 to January 2018 was conducted. This study was exempted from Institutional Review Board review by the Tamale Teaching Hospital, as it involves less than minimal risk to patients. Data from more than 95% of hospitals in the northern part (UER, UWR, and NR) of Ghana and 89% of hospitals in the transitional zone (BAR) were captured. All male patients above 17 y undergoing IH repair were included. Pediatric patients and females were excluded, as they rarely undergo IH repair with mesh in northern Ghana. Data were analyzed using multivariate logistic regression to determine predictors of mesh use. Population data from the 2010 Ghana Census data[17] were used to determine repair rates per population. All statistical analysis was implemented in Stata 15.1 (StataCorp. College Station, TX).

Results

Eight thousand eighty male patients with age of 17 y and above underwent IH repair at 41 hospitals in the northern part and transitional zone of Ghana. The average age at repair was 48.5 y (Fig. 1, Table 1). Most cases were performed at district hospitals (84%), followed by regional hospitals (14%), then teaching hospitals (2%). Right IH was most commonly repaired (41%), while right inguinoscrotal hernias represented 19% of cases. Twenty-five percent of cases were for left IHs, 9% for left inguinoscrotal hernias, and 6% for bilateral IHs. Most were repaired nonurgently (93%), while listed reasons for urgent cases included strangulation (0.93%), obstruction (0.32%), and incarceration (0.17%). Recurrences represented 0.77% of cases. Suture repair was the most common repair (85%) while mesh repair was performed in 15% of patients. The operation was most often performed by nonsurgeon physicians (66%) while the remaining was performed by surgeons (34%). Spinal anesthesia was most common (60%), followed by local (37%) and then general anesthesia (3%).

The overall rate of repair was 123 per 100,000 population. The UWR had the highest rates of repair at 295 per 100,000 population, followed by the UER (140) (Fig. 2). The NR and BAR both had repair rates of 96 per 100,000 population.

Rates of mesh repair were highest in the NR (35%), followed by the BAR (7%), then UWR (6%), and UER (4%) (Fig. 3). There was variation within regions, however, with low and high repair rates at the district level (Fig. 4). There was also variation of mesh use between hospitals, ranging from 0% to 100% (Fig. 5).

Patients with inguinoscrotal hernias were less likely to have repairs with mesh (Pearson's correlation coefficient = −0.05, $P < 0.005$). The strongest predictor of mesh use was surgery being performed by a surgeon (odds ratio [OR] 3.13, $P < 0.001$),