

# Feasibility and Safety of Prosthetic Implants for Inguinal Hernia Repair in a Nigerian Tertiary Hospital

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## ABSTRACT

**Background:** Worldwide, inguinal hernia repair is the commonest surgical procedure in general surgery, but the optimal repair technique for inguinal hernia has not been defined and accepted in most parts of Africa and other developing nations. The aim of this study was to determine the epidemiology of inguinal hernias and feasibility of mesh implants in our centre.

**Methodology:** This was a descriptive cross-sectional study of consecutive adult patients with uncomplicated inguinal hernias who received polypropylene mesh for repair of their inguinal hernias. Selection criteria included inguinoscrotal/inguinolabial hernia, recurrent or bilateral hernia or bubunocoeles with wide defects. Descriptive statistics and tests of significance were done.

**Results:** Inguinal hernia represented 77.3% of all abdominal wall hernias encountered during the study. However, only 27.8% (100 patients) of the 360 patients that satisfied the inclusion criteria received mesh implants. Of the 100 patients studied, 31% had recurrent hernias, 48% harbored complete

inguinoscrotal/inguinolabial hernia while 13% had incomplete inguinoscrotal hernia. Majority (86%) had unilateral hernia. The annual repair rates using mesh implants increased progressively from 4% in 2013 to 40% in 2017. A quarter (25%) had comorbidities. Majority (60%) of repairs were under general anesthesia. The overall postoperative complication rate was 14%. Wound infection rate was 3.5%. There was statistically significant difference in the rates of wound-related events between recurrent and primary inguinal hernias ( $p=0.000$ ). There was no mortality or recurrence recorded in this study.

**Conclusion:** The uptake of mesh implants for inguinal hernia repair in our environment is low, though the trend is changing with higher proportions of patients accepting mesh implants in recent time. Elective inguinal hernia surgery with polypropylene mesh is feasible, safe, effective and reproducible in our setting.

## INTRODUCTION

World-wide, inguinal hernia is the most common type of hernia, representing approximately 75% of all abdominal wall hernias.<sup>1-3</sup> Despite being the commonest surgical procedure in general surgery globally, the optimal repair technique for inguinal hernia has not been defined and accepted in most parts of Africa and developing world.<sup>4,5</sup> In the

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developed economy, the duo of laparoscopic and tension-free approaches has emerged as the gold standard for repair of inguinal hernia.<sup>6</sup>

In Africa, with the highest pool of longstanding, neglected inguinal hernias, Bassini method, though fraught with high recurrence and re-recurrence rates, has remained the preferred method of repair until recently when surgical policy is changing with slow shift to the Western pattern.<sup>1,4</sup> This is partly due to the fact that there is inadequate clinical and epidemiological data in the surgical literatures of African extract to inform surgeons working in the continent on the most appropriate repair method.<sup>4,7</sup> Other reasons adduced include financial constraints, insufficient surgical expertise, fear of implanting foreign materials and other socio-cultural barriers inherent in Africa and other low and middle-income countries (LMICs).<sup>2,4,8</sup>

Anatomic repair with sutures is associated with significant tension on the suture line leading to tissue ischaemia and ultimately failure of repair and recurrence.<sup>8,9</sup> In the face of the current global economic depression, the repair procedure associated with diminished recurrence is highly desirable in order to contain expense and limit psychological trauma associated with multiple re-operations.<sup>4</sup> In addition, repair of recurrent hernias is technically demanding compared to primary repair and may lead to life threatening postoperative complications.<sup>4,10,11</sup>

In Dakar, Seck *et al* reported on a series of 79 patients with 109 uncomplicated inguinal hernias, recruited over a period of 10 years and repaired according to Lichtenstein technique.<sup>11</sup> The authors noted that over half (41, 51.9%) of the patients had recurrences from previous suture-based repairs, but the previous recurrences notwithstanding, the wound infection (2.5%), haematoma (2.5%) and recurrence (0.9%) rates were low and amenable to conservative approaches. The above illustration indicates that prosthetic mesh repair of inguinal hernias is safe and feasible in Africa and should

replace tissue-based methods with documented high treatment failure.

In our general surgical practice, there is paucity of data on mesh repair of inguinal hernia. However, in recent time, the authors have increased their use of mesh in the repair of such hernias. This approach has yielded positive results and the audit of recent repairs performed in the Lichtenstein fashion is presented in this paper. The aim of this study is to determine the epidemiology of inguinal hernia and the feasibility of prosthetic mesh repair for inguinal hernias in our center.

## MATERIALS AND METHODS

This was a prospective study of all adults with inguinal hernias managed with prosthetic meshes at our center from January 2013 to December 2017. Initially, all patients aged 18 years and above who presented with abdominal wall hernia were seen and recorded, but only those with inguinal hernias were evaluated for possible inclusion in this study. Only those who gave consent for mesh were included. One hundred adult patients aged 18 years and above out of the 360 patients counselled for prosthetic implants accepted mesh and were scheduled for elective repair. Selection criteria included inguinoscrotal and inguinolabial hernia, recurrent or bilateral hernias or large bubunocoles with defect >4cm in the widest diameter. Patients presenting with complicated inguinal hernias, massive ascites, severe debilitating illnesses and those with metastatic intra-abdominal tumor or sepsis were excluded. Informed consent was obtained from all the patients before enrollment into the study.

## Procedure

Each of the 100 patients was interviewed by a specialist general surgeon. The patients' demographics and findings from detailed history and physical examination were recorded in a standard proforma. Of particular interest were the duration of hernia, presence of predisposing conditions, history of previous repairs and methods used for such

repairs, bilaterality and the size of the hernia defect. The size of the defect was manually estimated with fingers during assessment and hernia reduction maneuvers. Full blood count, urinalysis, serum electrolytes, creatinine and urea were done routinely. Other special tests like chest x-ray, abdominal ultrasound, electrocardiography and fasting blood sugar were done when indicated. Each patient was counseled for hernia implant and consent for mesh repair obtained. Pre-operatively, active infections were treated with antibiotics, anaemia and malnutrition corrected and deep venous thrombosis (DVT) prophylaxis commenced for those in the moderate to high risk category. The patients were scheduled for either local infiltration, spinal or general anaesthesia. Prophylactic antibiotic was routinely administered at time of induction of anaesthesia. The repair was done by Lichtenstein repair. In the early post-operative period, complications like wound infection, haematoma, scrotal oedema, seroma and bleeding were sought for and recorded. Length of hospital stay was also noted. Late complications like chronic groin pain, mesh infection or recurrences were also recorded when present. Patients were followed up actively for 24 months. Telephone interview were arranged for those who live far from our hospital and for those who defaulted from appointment and failed to attend the next clinic day.

Data were analyzed using Statistical Package for Social Sciences (SPSS) software version 22.0 (IBM, Chicago IL, USA, 2015). Data were presented as mean, standard deviation, percentages and tables. Confidence interval was calculated at 95% level and significance at 5% probability level ( $p < 0.05$ ).

The protocol for this study was approved by the Research and Ethics Committee Board of the Alex Ekwueme Federal Teaching Hospital, Abakaliki, Ebonyi State, Nigeria before commencement of the study. All ethical principles relating to studies on human subjects were observed during the study period.

## RESULTS

During the five years period of study, a total of 660 patients with abdominal wall hernias were seen, but 510 (77.3%) of them harbored inguinal hernias. Over two-thirds (70.6%, 360) of the patients were selected for mesh implants, but majority did not receive it due to financial constraints, unavailability of mesh, ignorance and socio-cultural practices. Ultimately, only 27.8% (100) of patients in this group had their hernias repaired with mesh and they formed our study population. The reasons for the low utilization of mesh implants to repair the remaining 72.2% of the included patients were financial constraints (234, 65.0%), fear of untoward effects (18 5.0%), ignorance (12, 3.3%), socio-cultural practices that prohibit permanent prosthetics (46, 12.8%), non-availability (6, 1.7%) and mixed reasons (44, 12.2%).

There were 89 males and 11 females giving a male to female ratio of 8:1. There is statistically significant difference in the sex of the patients for both primary and recurrent hernias ( $p=001$ ). The ages of the patients ranged from 18-83 years with a mean of 38.60 +/- SD 15.94 (Table 1). Majority (40%) of the patients were farmers, followed by professionals (32%).

**Table 1: Age and sex distribution of the patients**

Age range	Male	Female	Total	Percent (%)
10-19	10	1	11	11
20-29	16	2	18	18
30-39	20	3	23	23
40-49	26	2	28	28
50-59	8	1	9	9
60-69	4	1	5	5
70-79	4	1	5	5
80-89	1	0	1	1
Total	89	11	100	100.0

### Clinical presentation

Over four-fifth (86%) had unilateral hernia while the remaining patients had bilateral hernias. Nearly half (48%) had complete inguinoscrotal/inguinolabial hernias. Among 86 patients with unilateral hernias, 44 (51.2%) harbored complete inguino-scrotal/inguino-labial hernias, 30 (34.9%) had inguinal (bubonocele) and the rest (12,13.9%) had incomplete (funicular) inguino-scrotal hernias. Of the patients with bilateral hernias, three had recurrent hernias while 11 harbored primary hernias in both groins. The 14 patients with bilateral hernias had a total of 28 hernias comprising of four, six and eighteen inguinoscrotal, funicular and bubunoceles respectively (Table 2). In summary, there were 114 inguinal hernias repaired in the 100 patients.

**Table 2: Selection criteria of the hernias in the 100 patients.**

Clinical parameter	Frequency	Percent (%)
Primary Inguinoscrotal	29	29
Primary bubonocele	17	17
Primary Funicular	8	8
Primary inguinolabial	4	4
Recurrent inguinoscrotal	11	11
Recurrent bubonocele	13	13
Recurrent funicular	4	4
Bilateral inguinal hernia	14	14
Total	100	100
Bilateral hernias		
Recurrent bubo+primary bubonocele	2	2
Primary bubo + primary bubonocele	3	3
Primary bubo + primary funicular	5	5
Primary inguinoscrotal+primary bubo	3	3
Recurrent inguinoscrotal+primary funicular	1	1
Total	14	14

Bubo= bubonocele;

The other epidemiological characteristics of the patients and their hernias are shown below (Table 3). More than three-quarter (78%) presented after one year of noticing the hernias, and of these, 61.5% (48) waited till after five years of onset of hernia before presentation. A quarter (25, 25%) of the patients

presented with various comorbidities. However, many patients had two or more comorbidities ranging from hypertension (15.0%), obesity (8.0%), bladder outlet obstruction (6.0%), diabetes mellitus (7.0%) and others (10.0%). Nearly one-fifth (19, 19.0%) of the patients had associated extra-inguinal hernias (six incisional, five umbilical, three epigastric, three para-umbilical and 2 femoral) that were either primary (16, 84.2%) or recurrent (3, 15.8%).

### Surgical Treatment

The annual mesh utilization increases progressively; more than a third (40%) of the mesh repairs were performed in 2017 (Table 3). A Pfannestiel incision was routinely used for all bilateral case and tube drain inserted in the vast majority (96%) of repairs. Majority (60%) of the patients had their repairs under general anaesthesia, but spinal (47.1%) anaesthesia was the most frequently utilized procedure in those with comorbid illnesses (Table 4).

**Table 3: Clinical characteristics of the patients.**

Clinical parameter	Frequency	Percent (%)
Annual Repair rate		
2013	4	4
2014	10	10
2015	18	18
2016	28	28
2017	40	40
Total	100	100.0
Duration before presentation (months)		
0-6	6	6
7-12	16	16
>12	78	78
Total	100	100
Occupation		
Farmers	40	40
Professionals	32	32
Labourers	15	15
Artisans	6	6
Others	7	7
Total	100	100.0

**Table 4: Effect of clinical parameters on the choice of anaesthesia**

Clinical feature	GA	Spinal	LA	Total (%)
Nature of hernia				
Unilateral	50	31	5	86 (86)
Bilateral	10	4	0	14 (14)
Type of hernia				
Primary	40	24	5	69 (69)
Recurrent	20	11	0	31 (31)
Presence of comorbidity				
Present	14	8	3	25 (25)
Absent	46	27	2	75 (75)
Extent of hernia				
Unilateral bubonocoele	10	15	5	30 (30)
Unilateral inguinoscrotal	16	28	0	44 (44)
Unilateral funicular	5	7	0	12 (12)
Bilateral hernia	6	8	0	14 (14)

**Outcome of Treatment**

Overall, a complication rate of 14.0% was recorded, the highest being wound infection (3.5%). Preoperative recurrent hernia status was an independent predictor of postoperative adverse wound events ( $p=0.000$ ). There is significant statistical difference in wound infection rates of patients with comorbidities (diabetes mellitus and obesity) and patients without comorbid conditions ( $p=0.002$ ). However, only ten (10.0%) patients had post-operative complications, but some patients with bilateral hernias had complications in both groins giving rise to 16 post-operative events. All the complications were managed conservatively. There was no recurrence after two years of follow up (Table 5). No perioperative deaths were recorded. Majority (82.0%) of the patients were discharged within the first three days after operative repair. Those that stayed longer on admission were due to various reasons like comorbidities (6.0%), complications of surgery (8.0%) and inability to offset medical bills due to financial limitations (4%).

**Table 5: Postoperative complications**

Complication	Frequency (N=114)	Percent (%)
Wound infection	4	3.5
Hematoma	2	1.8
Seroma	2	1.8
Epididymorchitis	2	1.8
Bladder laceration	1	0.9
Urinary retention	1	0.9
Chronic groin pain	2	1.8
Recurrence	0	0.0
*Total	16	14.0

\*Some patients had more than one complication

**DISCUSSION**

The debate over the ideal repair techniques for inguinal hernia had continued throughout medical history. For over a century, the gold standard for inguinal hernia repair was herniorrhaphy as described by Bassini in 1884; other modifications like Shouldice, Mcvay and Maloney (darning) techniques were increasingly adopted.<sup>4,12</sup> A new milestone in inguinal hernia repair came with the use of prosthetic meshes for tension free repair as popularized by Lichtenstein in 1986; subsequently, 1000 cases of Lichtenstein repairs were published in 1989.<sup>13</sup> In their excellent report, the authors recorded no recurrences after five years of follow up, prompting other surgeons all over the globe to reconsider their surgical techniques and embrace the simple, reproducible tension-free hernioplasty as detailed by Lichtenstein.

In our institution, the flavour for the Lichtenstein method has not been marked until very recently. All the patients that met the inclusion criteria were counselled for mesh repair. However, majority of the patients that fulfilled the inclusion requirements could not receive mesh implants due to variable reasons ranging from financial constraints to multiple socio-cultural barriers. In the five years period of this study, we found that less than a third (100 patients, 27.8%) of 360 patients who were counseled for mesh implants ultimately had mesh

repair for their hernias. In the typical manner of hernia presentations in Africans, the 360 patients harbored hernias with adverse clinical indices that can predispose to early recurrence after tissue-based repairs (Tables 2 and 4). Their hernias were either recurrent, bilateral, inguinoscrotal / inguinolabial, extensive hernias with wide neck or combination of these features, yet mesh prosthetic repair was undertaken in only 100 patients and reason adduced for non-mesh use in the rest included financial constraints, fear of adverse reactions from mesh and numerous socio-cultural barriers.

The situation is the same across sub-Saharan Africa. In a referral hospital in Tanzania, Mabula and Chalya performed elective repair of inguinal hernias in 278 patients and used mesh in a single (0.4%) Indian patient.<sup>2</sup> The authors pointed out high cost and non-availability of prosthetic mesh as formidable barriers to its use in their centre and agreed with their colleagues from Sokoto and Ile-Ife both in Nigeria and Kenya.<sup>2,3,14,15</sup> Indeed, investigators from Nigeria, Kenya and Tanzania observed that Bassini method still enjoys wide popularity in sub-Saharan Africa mostly due to its simplicity, ease of execution and preference of the surgeons.<sup>[2,3,14,15]</sup> However, at about same time, Ohene-Yeboah and Abatanga extensively reviewed African literatures on inguinal hernias and noted inadequate clinical and epidemiological data to inform surgeons working in the continent on the most appropriate repair procedure.<sup>4</sup> This perhaps, explains why, in the sub-region, the change in government policies and surgeons' attitude towards use of prosthetic mesh has been very slow. A report from Sokoto in North West Nigeria showed that all 151 adult patients with inguinal hernias received anatomic, suture-based repairs; Bassini in 130 (86.1%), Shouldice in 12 (7.9%) and Maloney (nylon darning) in 9 (6.0%) patients.<sup>3</sup> The author emphasized that poverty and ignorance plagued his patients and this could have affected use of mesh among his patients. These findings overlapped with data reported by Odula and Kakande in Kampala where elective repairs in 89 patients with inguinal

hernias was done and none was repaired with prosthetic implants.<sup>16</sup>

In a recent publication from our unit, only 4(1.9%) out of 208 adult patients with elective inguinal hernias, recruited over a three years period had mesh implantation.<sup>17</sup> Indeed, the progress on mesh utilization in inguinal hernia repair recorded in the present report is partly a response to the gap in practice pointed out in that earlier publication. In the current study, mesh repair output increased progressively from four (4.0%) patients in 2013 to 40 patients (40.0%) in 2017 (Table 3). Over the years, we have resolved to increase mesh utilization for hernia repair in our centre. Internal policies to enhance mesh utilization have been enshrined in our practice. These, among others included facilitated counselling of the patients, mesh donations to patients and alternative assistance through medical social welfare and donor agency programs. Elsewhere, African surgeons have been enjoined to accept some responsibility and support system wide interest in inguinal hernia disease on the continent.<sup>4</sup> Investigators working in Ghana have suggested establishment of indigenous African organizations like a hernia society (or congress) for Africa, akin to European, American and recently Asia-Pacific Hernia Society.<sup>4</sup> As a road map for African surgeons, the step has been initiated by the European Hernia Society, under the auspices of Operation Hernia, through 60 medical missions spread across Africa and other low and middle income countries.<sup>8</sup>

Warwick and associates, working under Operation Hernia, recruited 1,748 patients from Nigeria, Ghana and Ivory Coast between 2005 to 2010 and repaired their inguinal hernias with prosthetic implants using either standard commercial meshes or treated mosquito net mesh.<sup>8</sup> The authors recommended use of non-treated mosquito nets as they were felt to be cheap and safe. They concluded that routine use of mesh in elective inguinal hernia repair in Africa is feasible and safe. In a bid to upscale tension free inguinal hernia repair in Africa, few surgeons have advanced the use of sterilized

mosquito net as a cheap alternative to commercial mesh, but deep concern exists for the suitability of these materials as they were not designed for use in humans and do not meet the requirement for an ideal mesh.<sup>18,19</sup> Other innovations like use of re-sterilized polypropylene mesh to save cost has been practiced in Calabar, Nigeria, for over a decade with no elevated infection rates.<sup>18</sup>

The double burden of late presentation and comorbidities was common among patients in the current study. It is noteworthy that over half (62.0%) of the patients presented later than 12 months after noticing their hernias. This health-seeking attitude is reflected in the high proportions of inguinoscrotal hernias, extensive hernias with wide neck and recurrent hernias reminiscent of long standing, neglected disease and high pre-existing repair failures due to inefficient repair methods. This pattern of presentation was noted in our previous publication in this unit and conforms with findings from similar studies in Nigeria, Tanzania, Sierra Leone, Liberia and India.<sup>17,3,18,20,22</sup> Generally, the reasons adduced by these patients included financial constraints, lack of awareness of disease, long distance from health facility, fear of surgery, feeling that hernia is not a dangerous disease and treatment by traditional and patent medicine dealers.<sup>2,3,7,18,20,21,22</sup> Indeed, hernia aid researchers working in Uganda have reported that not only do hernia patients in Africa present late, but that up to 50% of these hernias are eventually untreated.<sup>23</sup> More so, in studies by other authors, 65% and 76% have emergency hernia surgery in Ghana and Uganda respectively due to delayed presentation.<sup>23</sup>

The choice of anaesthetic technique was significantly determined by the clinico-epidemiologic profile of the patients and their hernias. The rate of utilization of local anaesthetic infiltration was highest among patients with unilateral hernia, primary hernias, bubonocoele and those with comorbidities compared to its application for bilateral, recurrent or inguinoscrotal hernias where its use was virtually non-existent in this series. Traditionally, general and spinal anaesthetic

techniques appear to be favored by many anesthetists and surgeons treating inguinal hernias in Africa.<sup>3,4,17,24</sup>

Interestingly, Olalekan *et al* in Ile-Ife, Nigeria performed nylon darning in 83.3% of their patients under local infiltrative anaesthesia.<sup>15</sup> The high utilization of local anaesthetic infiltration probably reflects institutional guidelines and practice in Ile-Ife, Nigeria. This is because a recent study from the same institution (Ile-Ife) showed that 65.8% of 41 patients with recurrent inguinal hernias had their hernias repaired under local infiltrative anaesthesia.<sup>10</sup> This feat is laudable, considering more difficult dissection for recurrent inguinal hernias that otherwise, would warrant more frequent use of general and spinal anesthesia (to enhance patients comfort and cooperation during repair). In East Africa, similar experience was shared by authors who reported that 52.3% of the inguinal hernia pool were repaired under local anaesthesia followed by spinal (35.3%) and then general anaesthesia (12.4%).<sup>8</sup> The authors emphasized the need for adequate training to meet and sustain the high hernia volume requiring surgical services in Africa.

The wound infection rate of 3.5% is lower than rates of 4.6% reported from Nigeria by Oribabor *et al* in Ekiti State, Nigeria following tension-free hernia repair with Mosquito-Net Mesh (MNM) cloth.<sup>19</sup> Due to shorter follow up by the investigators in Ekiti (six months), comparing long term results like recurrence and chronic groin pain was not justified and may be misleading.

Strict observance of aseptic principles, meticulous dissection and attention to haemostasis were perhaps, partly responsible for the low wound infection rate in this study. Mba had expressed curiosity over higher wound infection rate in elective inguinal hernia repairs compared to value in complicated cases while analyzing his results in Sokoto, Nigeria.<sup>3</sup> He attributed this paradoxical observation to the junior rank of surgeons usually involved in these often regarded simple procedures and non-observance of requisite strict aseptic technique and meticulous hemostasis.

## CONCLUSION

The utilization of prosthetic implants to repair complex inguinal hernias in our environment is low though a steady rise in the uptake has been observed in recent years. Multiple socio-cultural and economic barriers were the major reasons for the low uptake. Nevertheless, elective inguinal hernia surgery with polypropylene mesh is feasible, safe, effective and reproducible in our setting. There is pressing need for national health policy and private-public sector partnership initiatives to upscale inguinal hernia surgery output and mesh utilization in our environment.

## Limitation

The study is limited by the relatively low sample size and a follow up period was also not long enough to evaluate the recurrent rates satisfactorily. Furthermore, there were no controls to assess the impact of mesh on variables like recurrence, wound infection, chronic groin pain and seroma formation.

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## REFERENCES

1. Beard JH, Lawrence BO, Ohene-Yeboah M, Dicker RA, Harris HW. Characterising the global Burden of Surgical Disease: A Method to estimate Inguinal Hernia Epidemiology in Ghana. *World J Surg* 2013; 37: 498-503. DOI:10.1007/s00268-012-186-x
2. Mabula J B, Chalya P L. Surgical management of inguinal hernias at Bugando Medical Centre in Northwestern Tanzania: Our experiences in a resource-limited setting. *BMC Res. Notes* 2012; 5:585. DOI: 10.1186/1756-0500-5-585.
3. Mba N. Morbidity and Mortality Associated with Inguinal Hernia in Northwestern Nigeria. *West Afr J Med* 2007; 26(4):289-292.
4. Ohene-Yeboah M, Abantanga FA. Inguinal Hernia Disease in Africa: A common but Neglected Surgical condition. *West Afr. J. Med* 2011; 30(2):78-83.
5. Ohene – Yeboah M. Challenges of Inguinal Hernia Surgery in Ghana. *Postgraduate Med J. Ghana* 2016; 5(1):15-19
6. Roseberg J, Bisgaard T, Kehlet H, Wara P, Asmussen T, Juul P . Danish Hernia Database recommendations for the management of inguinal and femoral hernia in adults. *Dan Med. Bull* 2011; 58(2):42-43.
7. Patel HD, Groen RS, Kamara TB, Samai M, Farahzad MM. An estimate of hernia Prevalence in Sierra Leone from a nationwide community survey. *Hernia* 2014; 18:297-303. DOI: 10.1007/s10029-013-1179-3.
8. Warwick A, Oppong C, Boatong DB, Kingsnorth A. Inguinal hernia repair is safe in Africa. *East Cent. Afr. J Surg* 2013; 18(2):14-17
9. Ahmad S, Ahmed N, Singha JL Rayhan F, Hassan ASM, Hossain MA . Open Maloney Repair for Adult Inguinal Hernia; 5years experience in a Remote District. *J Shaheed Med Coll* 2017; 9(1):6-10. DOI: 10.3329/v10i/38896
10. Agbakwuru EA, Etoneyaku AC, Olasehinde O, Kolawole AO, Talabi A O, Akinkuole AA . Recurrent inguinal hernia in the Ile-Ife, Nigeria. Characteristics and Outcome of Management. *Niger J Surg Sci.* 2016; 26:33-38
11. Seck M, Cisse M, Sall M, Gueye M, Toure A, Thiam O . Open Tension Free Repair of Inguinal Hernias. The Lichtenstein technique. Advantages and limits in an African context: A retrospective study of 109 cases. *Internet J. Surg* 2017; 34(1): e52788.
12. Just E, Botet X, Martinez S, Escola D, Moreno I, Duque E . Reduction of the complication rate in



- Lichtenstein hernia repair. *Int J Surg* 2010; 8:462-465. DOI: 10.1016/j.ijsu.2010.006.
13. Lichtenstein IL, Just E, Shulman AG, Amid PK, Montllor MM. The tension free hernioplasty. *Am J Surg* 1989; 157:188-193.
  14. Wasike R, Abdallah A. Inguinal hernia repair at the Aga Khan Hospital, Nairobi: Practice and Preference discordance. *Ann Afri Surg* 2008; 2(1):23-28.
  15. Olasehinde OO, Adisa AO, Agbakwuru EA Etonyeaku AC, Kolawole O A, Mosanya AO. A 5-year review of Darning Technique of inguinal hernia repair. *NJS* 2015; 21(1):52-55.
  16. Odula PO, Kakande IM. Groin Hernia in Mulago Hospital, Kampala. *East Cent. Afr. J Surg* 2004; 9: 48-52.
  17. Ogbuanya AU, Emedike SC. Elective repair of uncomplicated inguinal hernia in South Eastern Nigeria. *Asian J. Med Sci* 2015; 7(2):90-95. DOI: 10.3126/ajms.v7i2.13349.
  18. Udo IA, Onwuezobe IA, Umeh KU. Resterilized Polypropylene Mesh for Inguinal Hernia Repair. *NJS* 2018; 24:19-22. DOI: 10.4103/njs.NJS-21-17.
  19. Oribabor FO, Amao OA, Akanni SO, Fatidinu SO. The use of non-treated mosquito Net Mesh cloth for a Tension Free inguinal hernia repair: Our experience. *Nig J Surg* 2015; 2(1):48-51. DOI: 10.4103/1117-6806.152726.
  20. Oyandipo OO, Afuwape OO, Irabor D O, Abdurrazzaq AI. Adult Abdominal wall hernia in Ibadan. *Ann Ib Postgrad Med* 2015; 13(2):94-99. PMID: PMCID4853882
  21. Abdalla GM, Taha SM, Algarni S, Alsobhi S, Mohammed N, Salih I. Huge inguinal Hernia in underserved Areas: An oblivion problem. *Austin Intern Med* 2018; 3(5):1040.
  22. Rao SS, Singh P, Gupta D, Narang R. Clinicoepidemiologic profile of inguinal hernia in Rural Medical College in central India. *J Mahatma Gandhi Inst Med Sci.* 2016; 21:116-121 DOI: 10.4103/0971-9903.189543.
  23. Alimoglu O, Ankarali S, Eren T, Leblebici M, Burcu B, Shamaileh T. Hernia Surgery in Uganda: An experience of Doctors worldwide. *Anatol Clin* 2016; 21(1): 48-53.
  24. Uoro NI, Agbor C, Emelike K, Bamidele AA. Early outcome of Inguinal Hernia Repair using Ultrapro Mesh in University of Calabar Teaching Hospital, Nigeria. *Intern J Third World Med* 2008; 6(2): e2229. DOI: 10.4103/0300-1652-137197.