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RECURRENT INGUINAL HERNIA: EPIDEMIOLOGY AND OUTCOMES OF SURGICAL REPAIR IN A RESOURCE-LIMITED SETTING

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RECURRENT INGUINAL HERNIA: EPIDEMIOLOGY AND OUTCOMES OF SURGICAL REPAIR IN A RESOURCE-LIMITED SETTING

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ABSTRACT

**Objective:** Worldwide, recurrence after inguinal hernia surgery is the most important reference standard against which hernia surgeons judge the effectiveness of a repair technique. This study aimed to document some aspects of the epidemiology and the outcomes of surgical repair of recurrent inguinal hernia in our institution.

**Design:** This was an analytical cross-sectional study carried out from January 2013 to December 2017 .

**Setting:** Surgery department, Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Ebonyi State, Nigeria.

**Subjects:** Adult patients with recurrent inguinal hernia aged 16 years and above were included.

**Intervention:** Mesh and non-mesh repairs

**Main outcomes measures:** Recurrence, wound infection, length of hospital stay and mortality

**Results:** There were 81 males and five females giving male:female ratio of 16:1. Majority (62, 72.1 %) of the patients were aged 45 years and above. Nearly half (41, 47.7%) were either obese or overweight. Sixteen (18.6%) patients presented in emergency; the rest (70, 81.4%) presented electively. Thirty-four (39.5%) patients had comorbidities and 69 (80.2%) received prosthetic mesh implants. Four (4.7%) patients had intestinal resection. The overall postoperative morbidity and mortality rates were 40.7% and 2.3% respectively. The recurrence rate was 2.3%. Obesity (p=0.033), wound infection (p=0.003), prolonged length of hospital stays (p=0.036) and suture-based repair (p=0.048) were independently and significantly associated with hernia recurrence. **Conclusion:** Many patients with recurrent

**inguinal hernia have associated comorbidities. Repair was associated with high postoperative adverse outcomes. The main predictors of recurrence after repair were obesity, wound infection and non-mesh repair method.**

## INTRODUCTION

Inguinal hernia repair represents a significant proportion of the general surgeons' workload worldwide [1,2,3]. Globally, the rates of recurrence after inguinal hernia repair vary between 1.1-33.0% [1,2]. Recurrence after hernia surgery is the most important reference standard against which most hernia surgeons judge the effectiveness of a repair method worldwide [2,4,5]. Most of the values quoted in the literature were derived from studies outside our environment and in majority of those series, the primary inguinal hernias were repaired with prosthetic meshes in contradistinction to non-mesh repair in the vast majority of cases in our setting [1,2,3,4,6,7].

Though, controllable technical risk factors such as surgical methods, anaesthesia techniques, mesh fixation techniques, surgeon's experience and hospital volume have been described as the main risk factors, other numerous uncontrollable patient-related risk factors (wound healing, gender, hernia anatomy, hernia type, obesity, smoking ) have been implicated in the development of recurrent inguinal hernia [1,2,4]. Hitherto, inguinal hernia repair in our institution was predominantly executed by suture-based, anatomic methods for which robust evidence exists that they are associated with higher treatment failures [2,5]. However, more recently, prosthetic meshes are being increasingly utilized to repair inguinal hernias in our practice especially the voluminous, bilateral, inguinoscrotal/inguinolabial and recurrent cases.

Therefore, the benefits of assessing the risk factors and then the outcome measures for treatment of a complication (in this case, recurrence) that is inseparably present in our surgical services for inguinal hernias cannot be overemphasized. Moreover, such assessment serves as an internal audit of previous repairs done in our environment, majority of which were performed by lower rank of surgeons in private, mission, general and tertiary hospitals, often without meshes. Data on this field of hernia are too scanty in our environment despite the reported higher hernia recurrences in Africa [5].

Most available discussions on this subject by African investigators were done hurriedly as part of a general report on inguinal hernia [3,5]. This study is the first regional (southeast) project to evaluate the risk factors and outcomes of repair of recurrent hernia in Nigeria. Information gained from this study, hopefully, will form a yardstick for surgeons with special interest in hernia to lead a campaign for policy changes that can elevate inguinal hernia to public health domain. The aim of this study is to document some aspects of the epidemiology of recurrent inguinal hernia and the outcomes of its surgical treatment in our setting.

## MATERIALS AND METHODS

### *Design and Setting*

This was an analytical cross-sectional study of all patients with recurrent inguinal hernia recruited over a five year period from January 2013 to December 2017. All the patients were managed at Alex Ekwueme Federal

University Teaching Hospital, Abakaliki (AEFUTHA), Southeast Nigeria.

#### *Study Population*

Patients aged 16 years and above and gave informed consent were included. Moribund patients or those with massive ascites or advanced intra-abdominal malignancies were excluded. Ninety-one adult patients with recurrent inguinal hernia, were initially seen. Of these, two failed to give consent and one each was moribund, had massive ascites and diagnosed with advanced abdominal malignancy respectively; these five patients were excluded. The remaining 86 patients formed our study population.

#### *Procedure*

Each patient was evaluated in the specialist surgery clinic, ward or accident and emergency (A/E) Unit. The socio-demographic and relevant clinical data were extracted from each patient and recorded. The relevant past medical history was also sought for. At the A/E department, all the patients who presented with complications were resuscitated before operative repair. Each patient was evaluated by specialist anaesthesiologist and planned for appropriate technique. The patients were assigned American Association of Anaesthesiologists (ASA) scores before operative treatment. All elective cases were counseled for mesh repair. Only those who could not afford the cost of mesh implants received suture-based repair.

Intra-operatively, nature (direct or indirect) of the hernia, defect size, the contents and state of the bowel (obstructed, strangulated, gangrenous and perforated) were noted and recorded. Skin sutures were removed on the 10<sup>th</sup> – 14<sup>th</sup> post-operative day. All the patients were specially scheduled for wound inspection on the 4<sup>th</sup>, 7<sup>th</sup> and 14<sup>th</sup> postoperative days. This approach was to look for evidence of surgical site infection (SSI). Patients were

followed up actively during surveillance at intervals of two weeks, six weeks, three months, six months, 12 months, 18 months and 24 months. During the follow-up period, evidence of hernia recurrence was sought; the wound scars were palpated and positive signs of tactile and expansile cough impulse tested.

#### *Statistical data analysis*

Data were analyzed using Statistical Package for Social Sciences (SPSS) software version 22.0 (IBM, Chicago, IL, USA, 2015). Descriptive statistics were employed to calculate categorical variables like percentages. The results were presented in tables. Mean and standard deviation were used to summarize continuous variables. Where appropriate, chi-square test was used to test for the level of significance of the variables. Confidence interval was calculated at 95% level and significance at 5% probability level ( $P < 0.05$ ).

#### *Ethical approval*

The proposal for this study was approved by the research and ethical committee of AEFUTHA, before commencement of the study. All research principles relating to studies on human subject were observed during the study.

## RESULTS

#### *Socio-demographic Characteristics*

During the period under review, 683 patients with inguinal hernias were seen; 91 (13.3%) were diagnosed with recurrent hernia, but only 86 (12.6%) met the inclusion criteria and formed the study population. There were 81 males and five females giving a male to female ratio of 16:1. The ages of the patients ranged between 16-82 years with a mean of 53.34 +/- SD14.88. Twenty-four (27.9%) patients were aged 45 years and below. Only two (2.3%) patients were aged more than 75

years. Majority (50, 58.1%) were farmers, followed by artisans (19, 22.1%), then traders (11, 12.8%) and others (6,7.0%). More than three-quarters (67, 77.9%) reside in the rural

area. The impact of socio-demographic factors on hernia recurrence is shown below (Table 1).

**Table 1**  
*Relation between Socio-demographic parameters and recurrence*

Parameter	Recurrence		Total
	Present	Absent	
<b>Age</b>			
16-45	1	23	24
>45	1	61	62
p-value	0.466		
X <sup>2</sup>	0.565		
95% C.I of odd ratio	2.818 (0.164-47.005)		
<b>BMI</b>			
Normal	0	45	45
Overweight	0	25	25
Obesity	2	14	16
p-value	0.033		
X <sup>2</sup>	5.383		
<b>Occupation</b>			
Farming	1	32	33
Artisan	1	18	19
Trading	0	12	12
Others	0	22	22
p-value	0.801		
X <sup>2</sup>	1.804		
<b>Smoking</b>			
Yes	1	28	29
No	1	56	57
p-value	1.000		
X <sup>2</sup>	0.243		
95% C.I of Odd ratio	2.000 (0.121-33.176)		

†BMI=Body Mass Index

#### *Clinical Presentation*

Sixteen (18.6%) patients presented in emergency, the rest (70, 81.4%) presented electively. Only six (7.0%) patients presented within one year of noticing the recurrence, 41

(47.7%) waited more than five years while 10.5% presented after 15 years of recurrence. There were 70 (81.4%) first recurrences, 11 (12.8%) re-recurrences (second recurrences) and five (5.8%) third recurrences. More than

one-third (34, 39.5%) had comorbidities. However, some patients had two or more comorbidities giving rise to a total of 51 comorbid illnesses. These included obesity (16,18.6%), hypertension(14,16.3%), benign prostatic hyperplasia(6,7.0%), diabetes mellitus (4,4.7) and others (11, 12.8%). The relation of clinicopathologic parameters and recurrence is shown below (Table 2).

**Table 2**  
*Relation between clinicopathologic parameters and recurrence*

Parameter	Recurrence		Total
	Present	Absent	
<b>Mode of presentation</b>			
Emergency	1	15	16
Elective	1	69	70
p-value	0.320		
$\chi^2$	1.507		
95% C.I of Odds ratio	5.000(0.295-84.776)		
<b>Comorbidity</b>			
Present	2	32	34
Absent	0	52	52
p-value	0.153		
$\chi^2$	3.132		
95% C.I of Odds ratio	0.941 (0.865-1.024)		
<b>Extent of hernia</b>			
Inguinoscrotal	1	20	21
Funicular	1	10	11
Bubunocele	0	54	54
p-value	0.136		
$\chi^2$	4.255		
<b>Sidedness</b>			
Right	1	49	50
Left	1	32	33
Bilateral	0	3	3
p-value	1.000		
$\chi^2$	1.432		

Seventy-two (83.7%) patients had previous repairs in non-specialist centres, the rest (14, 16.3%) were repaired in teaching hospitals. The vast majority (81, 94.2%) of the previous repairs were executed by suture-based method; however, the methods of repair (mesh or suture) could not be ascertained in

five (5.8%) patients. Still on the previous repair, 24 (27.9%) gave positive history of developing wound infection postoperatively while the rest either had no wound infection (54, 62.8%) or could not offer definite history (8, 9.3%).

*Surgical Treatment and Anaesthetic Assessment*

Majority (38, 44.2%) of the patients had ASA I; 32 (37.2%), 7 (8.1%) and 9 (10.5%) had ASA II, ASA III and ASA IV scores respectively. Majority (49, 57.0%) were fixed under general anaesthesia, followed by spinal (30, 34.9%); the rest (7, 8.1%) were done under local infiltrative anaesthesia. In the index repair, seven (43.8%) and nine (56.2%) of the 16 patients that presented acutely had obstructed and strangulated inguinal hernia (SIH) respectively. Four patients with SIH had intestinal resection, giving rise to a resection rate of 4.7% for all recurrent inguinal hernia and 25% for complicated recurrent inguinal hernia.

#### *Outcomes of Treatment*

The most frequent complication was wound infection (11, 12.8%) followed by seroma (5, 5.8%). The overall morbidity rate was 40.7%. Two (2.3%) patients developed recurrence during follow up. Other complications and outcome measures are shown below (Table 3). The recurrences occurred in non-mesh repair arm, in cases repaired by trainee surgeons, obese patients and in patients who developed wound infections postoperatively. The effect of peri-operative parameters on the recurrence is shown below (Table 4). Majority (7, 63.6%) of the wound infections occurred in those with inguinoscrotal hernia. The impact of the hernia type on the postoperative outcome measures is shown below (Table 5). Mortality rate was 2.3 %.

**Table 3**

*Post-operative complications*

<b>Complications</b>	Elective	Emergency	P-value
	No of complication (%)	No of complication (%)	
Wound infection	6 (8.6)	5(31.3)	0.002
Seroma	5 (7.1)	1 (6.3)	
Visceral injury	3 (4.3)	2 (12.5)	
Haematoma	4 (5.7)	2 (12.5)	
Secondary hydrocele	3 (2.9)	0 (0.0)	
Chronic groin pain	1 (1.4)	1 (6.3)	
Recurrence	1 (1.4)	1 (6.3)	
Total	23 (32.9)	12 (75.0)	
<b>LOHS (days)</b>			
Daycase	3(4.3)	0 (0.0)	0.041
1-3	55 (78.6)	1 (6.3)	
4-7	10(14.3)	10 (62.5)	
>7	2 (2.9)	5(31.3)	
<b>Mortality</b>	0 (0.0)	2 (12.5)	

†LOHS= length of hospital stay; ‡No = number

**Table 4**

*Relation between Peri-operative parameters and recurrence*

Parameters	Recurrence		Total
	Present	Absent	
<b>Method of current repair</b>			
Mesh	0	69	69
Suture	2	15	17
p-value	0.048		
X <sup>2</sup>	6.757		
95% C.I of Odd ratio	1.111(1.060-1.286)		
<b>Surgeon Cadre</b>			
Consultant	0	38	38
Non-consultant	2	46	48
p-value	0.501		
X <sup>2</sup>	1.621		
95% C.I of Odd ratio	1.043 (0.984-1.107)		
<b>Anaesthesia</b>			
General	1	29	30
Spinal	1	39	40
Local	0	16	16
p-value	1.000		
X <sup>2</sup>	0.877		
<b>Presentation</b>			
Emergency repair	1	15	16
Elective repair	1	69	70
p-value	0.033		
X <sup>2</sup>	7.836		
<b>LOHS</b>			
Day case	0	3	3
Emergency Admission	1	15	16
Elective Admission	1	66	67
p-value	0.036		
X <sup>2</sup>	6.943		

*†LOHS= Length of hospital stay*

**Table 5**

*Relation between extent of Hernia and postoperative outcomes*

Postoperative outcomes	Extent of Hernia			Total
	Inguinoscrotal	Funicular	Bubunocele	
<b>Recurrence</b>				
Present	1	1	0	2
Absent	20	10	54	84
p-value	0.136			
X <sup>2</sup>	4.255			
<b>Wound infection</b>				
Present	7	3	1	11
Absent	14	8	53	75
p-value	0.046			
X <sup>2</sup>	6.411			
<b>Other Morbidities</b>				
Present	7	4	18	29
Absent	14	7	36	57
p-value	1.000			
X <sup>2</sup>	0.039			
<b>LOHS</b>				
Daycase	1	0	2	3
Admission	20	11	52	83
p-value	0.500			
X <sup>2</sup>	1.772			
<b>Mortality</b>				
Present	0	0	2	2
Absent	21	11	52	84
p-value	0.690			
X <sup>2</sup>	1.890			

†LOHS= length of hospital stay.

## DISCUSSION

The vast majority of patients in this series were males aged 45 years and above who were either farmers or artisans and predominantly reside in the rural areas. The patients were also heterogeneous in relevant surgical and medical history as more than a tenth (11,12.8%) of them had second recurrence (re-

recurrence) and over a third (34, 39.5%) have co-existing medical conditions.

In the literature [4,6], up to 13-15% of all inguinal hernia procedures are being performed for recurrent hernias, which overlapped with the rate of 13.3% observed in this series. Considering the higher risk of postoperative complications in operations performed for recurrent compared to primary hernias, the rate quoted above is



epidemiologically significant, worrisome and expresses the need for surgeons and health policy makers to institute system-wide approaches to scale down the recurrences. The initial step would involve adequate understanding and determination to positively modify the numerous controllable technical and uncontrollable patient-related risk factors [1,2,4,6,8]. The crux of the matter with recurrent inguinal hernias lies with its higher postoperative morbidity and mortality rates [9,10,11].

In the current discourse, there was no statistically significant difference ( $p=0.501$ ) in the recurrence rates for the two cadres of surgeons. Perhaps, the type of hernia, the mode of presentation, comorbidities and postoperative morbidities were important modifiers of the surgeons' status. Curiously, the close association between majority (83.7%) of the previous repairs and non-specialist health institutions was striking. It is unfortunate that operations for hernia, a common, but neglected surgical condition that is potentially curable with minimal post-operative adverse outcomes when repaired electively by a certified surgeon have largely been taken over by general duty doctors and other lower rank of surgeons in our practice and many other tertiary centres in Africa [2,12]. Regrettably, the general surgeon becomes saddled with the less rewarding operations for gastro-intestinal malignancies, breast cancers, endocrine neoplasia and hepato-biliary conditions. The reason for higher incidence of recurrence in previous repairs performed by general duty doctors compared to those done by a hernia surgeon may be partly related to a wide gap in the surgical skills and knowledge of the surgical anatomy of the inguinal area between the two categories of clinicians. Mba, from Sokoto, Nigeria, expressed curiosity over the higher

rates of post-operative aftermaths following simple elective inguinal hernia repairs performed by junior rank of surgeons compared to rates recorded for repair of complicated hernias by general surgeons [12]. The author suggested that this paradoxical observation may have been predicated on the non-observance of requisite surgical principles by the junior doctors [12].

Emerging evidence from published data indicates that the burden of unmet needs for surgery in LMICs has reached epidemic proportions and the urgent requirement to upscale surgical capacity in these regions has led to surgical training of non-physician clinicians (NPC) to perform general surgical (like repair of inguinal hernia), obstetric and gynaecological operations in many remote areas, but some investigators have questioned the effectiveness and safety of this program [11,13,14]. Available data from published series indicate that on-the-job training of dedicated, local personnel in South Sudan, Senegal, Somali, Zambia, Malawi, Thailand, Bangladesh, India, Uganda, Ethiopia, Tanzania and Mozambique has led to performance of general surgical emergencies, including inguinal hernias repair by the NPCs [11,14]. Though, discussion on this program has been a subject of lively debate, the critical denominator is the coordinated surgical training involving hands on bench surgery. However, the situation may not be same in our environment, where we observed that hernia repairs are being performed by non-physician health workers, who were never exposed to any organized surgical training. The activities of the NPCs in our environment might be responsible for some of the recurrent hernia cases referred to our centre.

Indeed, recurrence after inguinal hernia repair is the most important single prognostic

indicator of successful repair and should be avoided at all cost. Its development tasks the skills and resources of even the most astute of surgeon. Remarkably, obesity and wound infection remained the absolute risk factors for inguinal hernia recurrence in this study. Postoperative wound infection has been shown to impair healing, reduce tensile strength of wound and promote scar tissue deposition which subsequently leads to weakness in the abdominal wall and encourages herniation [4,6]. Obesity on the other hand induces sustained raised intra-abdominal pressure (RIAP) and predisposes surgical wounds to infection [6,8].

Another important predictor of hernia recurrence is the method of repair. The two recurrences in this series were found in cases repaired by suture-based method. The enthusiastic acceptance of mesh implants in 98.6% of those who had elective repairs is impressive and the explanation may be related to the possible fear of re-recurrence and also vigorous enlightenment, advocacy and donations by the authors. In a referral centre at Ile-Ife Nigeria, 48.8% of the recurrent inguinal hernias were fixed with mesh implants, which is still commendable in our environment, because other series reporting on unselected inguinal hernia cases in Nigeria have quoted dismal mesh uptake rates ranging from 0.0-5.0% [3,12,17].

Though hernia type was not implicated in Turkey [4], repair of inguinoscrotal or funicular hernia was associated with higher recurrences and other morbidities in our series, probably due to the fact that hernias in our environment are more voluminous compared to hernias in European series, and commonly repaired without prosthetic meshes [Table 5]. Indeed, large inguinal hernias are common in Africa, and in the past, some attained the size of human head or

extended to the knee and some accommodated several viscera that were said to have forfeited their right to domicile within the abdominal cavity [12,15,16].

A surgeon repairing recurrent inguinal hernias in our environment faces an additional challenge different from his colleagues in other centres, because facilities and expertise in laparo-endoscopic technique are scarcely available in our setting. Due to difficult dissections and increased risk of iatrogenic injuries during repair of recurrent inguinal hernia, the International Endohernia Society (IEHS) guidelines proposed that a surgeon should approach the inguinal area through undisturbed tissue planes when repairing recurrent hernia [6]. Precisely, in the case of previous anterior repair, one should use the posterior route (Totally Extra Peritoneal- TEP, or Trans-Abdominal Pre-Peritoneal – TAPP repair) to repair the recurrence, and vice versa [6]. It can be argued that the percentage of visceral injuries, haematoma and seromas recorded in this series would have been reduced if a laparoscopic posterior route was utilized.

In a case series involving five re-laparoscopic repairs, Metin and colleagues noted that recurrences occurred within a mean period of eight months, citing small mesh size, mesh migration and insufficient fixation as the main technical errors that caused repair failures [7]. From the foregoing, recurrence after inguinal hernia repair remains a huge challenge to the hernia surgeon, considering the fact that it can occur after tissue or prosthetic repair as well as in open or laparoscopic inguinal hernia repair. Elsewhere, it has been cited that recurrence occurs in 10-30%, 02-4.8%, 0.5-2.4%, 0.0-7.0%, 0-3.5% and 1.0-4.3% following Bassini method, Shouldice repair, Lichtenstein

technique, Stoppa's technique, TEP and TAPP respectively [6].

In Nigeria, the postoperative morbidity rates after repair of unselected abdominal wall hernia ranges from 4.2-12.4% [3,12,17]. However, post-operative morbidity rate of 40.7% and wound infection rate of 12.8% recorded in this series are high compared to rates of 11.5% and 3.9% for morbidity and wound infection rates respectively in a recent series for unselected inguinal hernia patients from our institution [3]. In a referral hospital in Ibadan [17], Nigeria, comparable post-operative complication rate of 11.0% for unselected patients was reported giving credence to earlier reports that surgical repair of recurrent hernias carries elevated post-operative morbidity and mortality [1,2,4,5]. Figures from Ile-Ife, Nigeria were quoted at 36.6% and 9.8% for overall post-operative complication rates and wound infection rate respectively, following repair of recurrent inguinal hernia [2].

*Limitation:* This study was limited by short follow up of two years and the relatively small population size of the patients.

## CONCLUSION

Considerable proportion of patients in our locality present with recurrent inguinal hernia, creating a pool of patients with higher risk of major postoperative morbidity and mortality. Obesity, non-mesh repair and postoperative wound infection were found to be significantly and independently associated with recurrence after repair of recurrent inguinal hernia. Large inguinoscrotal and funicular variants are important predictors of postoperative wound infection.

*Recommendation:* Policy changes like inclusion of mesh in the National Health Insurance Scheme coverage, establishment of

a national hernia society vested with the responsibility of training and re-training doctors in district and private hospitals on the use of mesh and inclusion of hernia into public health programs are urgently needed. Close supervision and long training of trainee surgeons by the general surgeons on the proper techniques of tissue and mesh repairs cannot be overemphasized.

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