



Original Article

A Retrospective Review of Indications and Outcomes for Esophageal Resection in a Low Volume, Tertiary Institution in North Central Nigeria

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Abstract

Introduction: Esophageal resections for both malignant and benign diseases are on the rise worldwide, highlighting the growing need for effective strategies in its surgical management which may be complex. The overall survival of patients post esophagectomy depends on multiple factors including the nature of the disease, comorbidities, age, and nutritional status of patients. There are few reports of indications and outcomes of this procedure in resource-constrained healthcare settings.

Objective: To describe the indications, management, and outcomes of esophageal resection at the University of Ilorin Teaching Hospital (UITH), North Central Nigeria. **Methods:** A retrospective, descriptive study of patients who underwent esophageal resection in UITH over 10 years between January 2010 and December 2019. **Results:** Twenty-two (11 males and 11 females) patients had esophageal resection with an average age of 28 years. The most prevalent clinical presentation was grade 4 dysphagia, affecting nearly half (45.5%) of the patients. Benign esophageal diseases were the most common indication for esophagectomy with corrosive stricture accounting for 31.8% of cases. Nine patients (40.9%) had feeding jejunostomy, while 1 (4.5%) patient had a feeding gastrostomy pre-esophageal resection. Trans hiatal approach was the most commonly used approach (68% of cases), with the stomach utilized as the replacement option in all cases. Eighteen (81.8% of cases) patients were nursed in the postoperative period in the ICU for about 24 hours. The average intraoperative blood loss was 469ml. Two (9.1%) of the patients had anastomotic leak which was amenable to non-operative management. Three (13.6%) patients developed post-operative esophageal stenosis and had esophageal dilatation with improvement in functional outcome. Two (9.1%) male patients died within 30 days post-operation. **Conclusion:** Esophagectomy is more commonly performed for benign than malignant esophageal diseases in UITH. Transhiatal esophagectomy is a feasible and safe procedure in most of these patients with satisfactory outcomes. In our experience, the transhiatal route was more commonly used with the stomach as the replacement option of choice. However, it remains vital to individualize care for optimal outcomes.

Keywords: Esophageal resections, Transhiatal esophagectomy, Jejunostomy, Esophageal disease

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Introduction

Esophageal resections for both malignant and benign diseases are on the rise worldwide¹. A study examining data from the New South Wales central cancer registry

between 2000 and 2007 found an 18.2% increase in esophagectomy rates for malignant lesions^{2,3}. This trend highlights the growing need for effective strategies and capacity building to engage this complex procedure.

Esophagectomy itself is a high-risk surgery, with a reported morbidity rate of 64% and a 3.3% risk of perioperative mortality⁴. High-volume centers with established multidisciplinary teams and support systems have demonstrated improved outcomes by reducing complications and managing complex cases⁵.

Consequently, regionalization of esophageal surgery has been proposed to improve overall patient care. However, studies have shown similar outcomes achieved by surgeons in different volume categories^{5,6}. Additionally, several barriers prevent patient access to high-volume centers, leading to a global predominance of esophagectomies performed in lower-volume settings.

In Nigeria, esophagectomy, along with other high-risk procedures like lung resections and open-heart surgery, is not currently regionalized^{7, 8}. Despite this, existing reports, though limited, primarily originate from centers with relatively higher surgical volumes, more experienced teams, and more developed supportive care units with high dependency units (HDUs)^{7,8}. This report details our experience at a low-volume center in a tertiary institution in North-central Nigeria.

Materials and Methods

Study Design and Data Collection

This is a retrospective study analysing data from patients who underwent esophageal resection at the University of Ilorin Teaching Hospital (UIITH). The study period spanned ten years, from January 2010 to December 2019. UIITH is located in Ilorin, Kwara state, North Central Nigeria and it is a tertiary hospital serving as a referral center for four neighboring states.

We reviewed the medical records of all patients who underwent esophageal resection during this period and extracted clinical data was recorded using a specifically designed excel spreadsheet for analysis. This data encompassed demographic details (age and gender), presenting complaints, reasons for the esophageal resection, surgical procedure details, admission to the Intensive Care Unit (ICU), need for mechanical ventilation, complications encountered, and follow-up information.

Study Center Resources and Protocol

During the study period (2010-2019), the study center possessed an eight-bed cardiothoracic unit equipped with bedside multi-parameter patient monitors and piped oxygen. However, dedicated ICU and HDU were not yet operational. Consequently, the hospital's four-bed general ICU, shared by all departments, was utilized. Preoperative Assessment and Nutritional Support

All patients had comprehensive pre-operative assessment including biometrics (weight, height and BMI) measurement, complete blood count, serum glucose, serum electrolytes, urea, creatinine, protein, and albumin. Radiological investigations included chest X-rays, barium swallow studies, and CT scans (in cases of suspected neoplasia). An upper gastrointestinal endoscopy was performed as indicated.

We tailored nutritional rehabilitation plans based on the severity of dysphagia, assessed according to Mellows and Pinka's grading as presented by Ahmed *et al*⁹, and malnutrition assessment using the BMI and serum protein levels. First-line support involved oral or nasogastric tube feeding with parenteral supplementation delivered through peripheral a vein. Second-line support, for patients with severe dysphagia (grade 3 or 4) or a BMI below 15 kg/m², involved enteral surgical tube feeding via a jejunostomy or gastrostomy using a 16-24 French Foley catheter.

Preoperative fluid and electrolyte management included a combination of 5% and 10% dextrose water, normal saline, and potassium replacement (estimated using existing standard formula) as necessary. Intravenous vitamin B complex, C, and K supplementation were provided alongside enteral feeding supplementation.

Anesthesia Technique

General anesthesia with cuffed endotracheal intubation was employed for all patients. Induction involved fentanyl (1.5µg/kg), propofol (2mg/kg), and suxamethonium (1.5mg/kg). Anesthesia was maintained with 1-2.5% isoflurane, pancuronium, and fentanyl. Cardiovascular monitoring included non-invasive automated monitoring of blood pressure, heart rate, oxygen saturation (SPO₂), and electrocardiogram via a multiparameter patient monitor.

Surgical Technique

A two-team approach was used for all procedures, with separate abdominal and neck surgery teams in order to reduce surgical time. The abdominal team began with an upper midline laparotomy incision to explore the abdomen, mobilize the stomach, and perform trans-hiatal esophageal dissection to separate the esophagus from surrounding tissues in the lower chest. The neck team dissected the esophagus from the trachea through an oblique incision along the anterior border of the left sternocleidomastoid muscle.

During gastric mobilization, the short gastric, left gastric and left gastroepiploic arteries were ligated carefully not disrupting the perigastric arterial arcade. The right gastroepiploic artery was preserved as the feeder blood supply for the gastric conduit. Conventional gastric tubularization as described by Kirsner-Akiyama¹⁰ was performed to facilitate a tension-free anastomosis in the neck where necessary. A drainage procedure (pyloric seromuscular slit or Heineke-Mikulicz pyloroplasty) was routinely performed to prevent conduit outlet obstruction.

The Orringer procedure (esophagogastric anastomosis in the neck) was the preferred anastomosis, and a second option was abdominal esophagogastric anastomosis. The first option of the anastomotic technique was an end-to-side, hand-sewn, double-layered anastomosis using interrupted silk sutures (3/0 or 2/0). Stapled anastomosis was a second option based on affordability.

Patients who had corrosive stricture involving the cervical esophagus had retrograde bouginage of the cervical stump using Hager's dilator and lateral split proximally towards the pharynx. The stomach was then parachuted on the esophagus for the anastomosis. Prophylactic closed thoracostomy tube drainage was performed bilaterally in all patients. Neck-drains (corrugated rubber or improvised finger latex glove) placed lateral to the neck incision and directed into the superior mediastinum were used for patients with cervical anastomosis.

Postoperative Protocol

Patients were transferred to the ICU if they did not maintain adequate oxygen saturation after extubation. Otherwise, after successful extubation on the operating table, stable patients were transferred directly to the cardiothoracic surgery ward after stabilization in the recovery room. Neither epidural analgesia nor central venous line catheters were used. They had intravenous fluid, parenteral analgesia (combination of paracetamol and an opioid), and parenteral antibiotics was administered for 72hrs. The nasogastric tube, neck and chest drains were removed on post-operative day 7 after a methylene blue dye test performed on day 5 confirmed no leakage.

Data Analysis

Data analysis was performed using the Statistical Package for Social Science (SPSS®) version24 (SPSS Inc. for Mac, IBM Corporation Inc. Chicago, IL. USA) and results are presented with descriptive statistics.

Results

Patient Demographics and Characteristics

A total of 22 patients underwent esophageal resection during the study period. The study population comprised of an equal number of males and females, with an average age of 28 years (15 days to 66 years) (Table 1). As shown in Table 1, the most prevalent clinical presentation was grade 4 dysphagia, affecting nearly half (45.5%) of the patients. Corrosive stricture was the most common indication for esophagectomy, accounting for seven patients (31.8%).

Preoperative Management

Nine patients (40.9%) required feeding jejunostomy placement for nutritional support before esophagectomy. Corrosive stricture (5 patients) and achalasia (4 patients) were the primary reasons for jejunostomy placement (Table 2). One neonate received a feeding gastrostomy before esophagectomy as neonates tend to tolerate jejunostomy poorly. The remaining patients (12, 54.5%) maintained oral nutrition supplemented with parenteral intravenous supplementation.

Two patients (9%) had undergone prior esophageal surgery (Table 1). One had severe dysphagia

following distal oesophageal fibrosis following a leak from a repaired perforated site of modified Heller's cardiomyotomy done for grade II achalasia; and the other, a neonate operated initially for tracheo-esophageal fistula (TEF).

Table 1: Patient Characteristics

Socio-demographic variable and Presentation	Respondents n (%)
Age (Mean $\pm$ SD)	28.13 $\pm$ 4.8
$\leq$ 45years	14 (63.6%)
>45years	8 (36.4%)
Gender (Male: Female)	1: 1
Male	11 (50%)
Female	11 (50%)
Grades of dysphagia (Modified Mellows & Pinkas)	
Grade 1 dysphagia	2 (9.1%)
Grade 2 dysphagia	1 (4.5%)
Grade 3 dysphagia	7 (31.8%)
Grade 4 dysphagia	10 (45.5%)
Diagnosis	
Benign Disease	17 (77.3%)
Corrosive esophageal stricture	7 (31.8%)
Achalasia (Grade IV)	4 (18.2%)
Peptic stricture	3 (13.6%)
Esophageal Atresia + TOF	2 (9.1%)
Fibrosis post modified	1 (4.5%)
Heller's	
Malignant Tumor	5 (22.7%)
Primary esophageal cancer	4 (18.2%)
Secondary (invasion) from stomach	1 (4.5%)
Prior Esophageal Surgery	
Yes	2 (9.1%)
No	20 (90.9%)

Surgical Approach and Postoperative Care

The trans-hiatal approach was the preferred surgical technique in all cases, with the stomach used as the replacement tissue for the resected esophagus (Table 2). Orringer anastomosis was used in all except in two patients. The first is a middle-aged man with both distal esophageal cancer and portal hypertension. He underwent trans-abdominal resection and during a blind trans-hiatal dissection. The second was the young lady who had distal oesophageal fibrosis following modified Heller's esophagocardiomyotomy presented above. All anastomoses were hand-sewn except in two patients; one neck anastomosis (linear stapler) and the lady who had abdominal esophagogastric following distal esophageal resection (circular stapler).

The average intraoperative blood loss was 469 mL (range: 15 mL to 700 mL). The majority of patients (81.8%) received initial postoperative care in the ICU for approximately 24 hours before transfer to the cardiothoracic ward for continued recovery.

Table 2: Procedures performed in the study population

esophagogastric anastomosis to avoid excessive bleeding

Procedure	Results n (%)
Approach to resection	22(100%)
Trans hiatal oesophagectomy	17(77.3%)
Transthoracic oesophagectomy	5(22.7%)
Use of feeding enterostomy	22(100%)
Jejunostomy prior to esophageal resection	9(40.9%)
Gastrostomy prior to esophageal resection	1(4.5%)
Jejunostomy during esophageal resection	12 (54.5%)

Complications and Mortality

A total of 12 patients (54.5%) experienced postoperative complications; using the Clavien-Dindo classification¹¹, the majority, (7 or 58.3%) were classified as grade 1 (minor complications). Three patients (25%) were grade 3b complications (major complications with the need for an intervention without organ failure). The remaining two patients (16.7%) were grade 5 complications (mortality).

Table 3: Post-operative Outcomes in Study Population

Post-operative Outcome	Results n (%)
ICU admission	
Yes	18 (81.8%)
No	4 (18.2%)
Duration of hospital stay (days)	22 (100%)
≤21	10 (45.5%)
>21	12 (55.5%)
Mean duration ± SD	21.45±2.5
Complications	10 (45.5%)
SSI	3 (13.6%)
Esophageal stenosis	3 (13.6%)
Post-operative Ileus	2 (9.1%)
Anastomotic Leak	2 (9.1%)
Functional Outcome	22 (100%)
No dysphagia	18 (81.8%)
Grade 2 dysphagia	3 (13.6%)
Not assessed	1 (4.5%)
Mortality	2 (9.1%)

Three patients (13.6%) developed esophageal stenosis with grade 2 dysphagia postoperatively (Table 3). These patients had corrosive stricture which involved the cervical oesophagus and were successfully managed with esophageal dilatation with dysphagia improving to grade 1 after five to six dilatation sessions.

Anastomotic leakage in two patients (9.1%) resolved with non-operative management. The first was in a middle-aged male with esophageal carcinoma who underwent a hand-sewn cervical esophagogastric anastomosis. The second, a young lady who attempted suicide by ingesting a mixture of household bleach (Hypo®) and an insecticide (Sniper®) required a fundus rotation gastropasty as described by Hartwig *et al* [10] in

order to gain additional length for the gastric tube to reach the pharynx because the stricture involved the entire esophagus. The leak occurred at the inferior angle of rotated segment.

Superficial surgical site infection (13.6%) and esophageal stenosis (13.6%) were the most common postoperative complications (Table 3). Other complications are detailed in the table. The average follow-up period was 6.4 months (range: 2 weeks to 2 years). None of the patients, including those with malignancy, had a recurrence of their primary pathology within the follow-up period.

Two patients (9.1%) died within 30 days of surgery. One was the premature neonate delivered at 36 weeks' gestation with Type C esophageal atresia who developed pneumonia with sepsis. The second mortality was a young adult male with a proximal gastric tumor extending into the distal esophagus. This patient underwent proximal gastrectomy with distal esophagectomy but developed aspiration pneumonia with severe sepsis, ultimately succumbing on postoperative day 20. The decision for proximal gastrectomy was made due to the anticipated challenges associated with managing total gastrectomy patients in our setting.

Discussion

Esophageal resection is a high-risk procedure that is preferred to be performed in high-volume regional centers. This report sharing the experience of a low-volume center in a low-income setting showed that esophagectomy was most commonly performed for benign conditions in patients presenting with dysphagia. Preoperative nutrition was maintained mostly by parenteral supplementation and jejunostomy instituted in a few. The stomach was the sole replacement conduit utilized, and the trans-hiatal technique was the most common surgical approach.

Most of the patients in this study were below 45 years old, which is understandable as benign pathologies constituted the most common indication for esophageal resection. This finding is similar to that noted by Okugbo *et al.* in Benin, south-eastern, Nigeria where the average age of patients who had esophageal resection was 30.9 years with the majority being for benign esophageal diseases as well¹². Inuwa *et al.* made similar findings in Kano, northern Nigeria¹³.

Our study population comprised an equal number of males and females. This sex distribution differs from that in the study by Saleem *et al.* who shared a 14-years' experience with esophageal replacement with male preponderance¹⁴ but is similar to the distribution reported by Okugbo *et al.*¹².

In this review, the most common indications for esophagectomy were corrosive stricture, accounting for 31.8% of cases. This was closely followed by end-stage achalasia and esophageal cancer (each comprising 22.7% of cases). Similar findings were made in other studies in Nigeria¹⁵ and Ghana¹⁶. However, in western

countries, the most common indication for esophageal resection is esophageal cancer^{17,18,19}.

This study examined esophagectomy outcomes at our low-volume center. Unlike high-volume centers where malignant cases dominate, benign conditions like esophageal strictures were the most frequent reason for esophagectomy in our patient population. This is likely due to the practice of commercial home-making of soaps as micro-business in the largely poor socioeconomic population. Caustic agents for production of soaps are stored poorly in unconventional containers making accidental ingestion rampant. Socioeconomic frustrations and disappointments also predispose to suicidal tendencies by ingestion of corrosive agents. Added to these are factors affecting early detection and treatment of esophageal cancer in our region^{20,21,22}. Interestingly, our findings on tumor location (distal esophagus) align with some other studies^{7,23}.

Approach-Shifting Trends in Esophagectomy Techniques

Minimally invasive surgery and robotic-assisted thoracoscopic esophagectomy are gaining traction, but traditional techniques like transthoracic esophagectomy (Ivor Lewis) and transhiatal esophagectomy remain common practice^{24,25}. The choice of approach depends on the location and type of oesophageal disease. In our center, the transhiatal approach was preferred because it has been found to help minimize postoperative pain and pulmonary complications, avert mediastinitis in the event of an anastomotic leak, and reduce surgical time. Other studies from Nigeria²⁶ and Ethiopia²⁷ indicate favorable outcomes with the use of transhiatal esophagectomy.

Conduit Selection and Overall Survival

Generally, a healthy stomach is the preferred conduit for oesophageal replacement because of its vascularity, extensibility, and the need for only one anastomosis²⁸. The stomach was also our first choice of conduit and was used in all the patients in this study. The colon or jejunum are alternatives. Some centers routinely perform colon interposition^{29,30} as the colon also is roomy and well vascularized. In Nigeria, Okugbo et al¹² reported the use of the colon for esophageal replacement with equally good outcome outcomes. The risks of colonic replacement include multiple anastomosis and anastomotic leak.

Preoperative Management

Preoperative nutritional rehabilitation is often necessary for patients presenting with dysphagia. In such instance instances, a feeding jejunostomy is commonly used. Up to 40.9% of the patients in our review had feeding jejunostomy before oesophageal resection. The remaining patients had feeding jejunostomy during the resection surgery to facilitate early postoperative enteral feeding and to prevent malnutrition. A similar protocol

was reported used by Weijs et al in the Netherlands³¹ and by Anumenechi et al in their study in Zaria, Nigeria³².

Postoperative Management and Outcomes

Most esophagectomy patients are managed in the ICU for the first 24 hours after surgery, a practice becoming less common with the use of thoracic epidural analgesia³³. Our center currently lacks fully developed HDU for postoperative care^{31,34,35} hence our protocol forward management of stable patients.

The complication rate in our study, was within previously reported range^{22,36}. Superficial surgical site infection and esophageal stenosis were the most common complications, similar to findings in other studies^{7,37}.

Mortality in our study was comparable to some reports³⁸, but lower than others³⁷. Pulmonary complications, as reported previously³⁹, were the cause of death in both mortalities we recorded. The length of hospital stay in our study was similar to other reports^{22,37}. High hospital and surgeon volume have been linked to lower mortality rates, suggesting potential benefits of regionalization³⁹⁻⁴⁰. However, cost and accessibility often limit access to high-volume centers⁴¹. A study by Funk et al found that low-volume centers with specific characteristics including high nurse ratios, medical oncology services, and advanced investigative tools had lower mortality rates compared to those lacking these features⁴¹, consequently establishing a thorough preoperative preparation and perioperative surveillance system might compensate for volume and achieve similar outcomes.

During follow-up, most patients reported symptom relief and weight gain, similar to other studies [38]. Patients with bothersome dysphagia underwent dilation procedures with satisfactory results.

Limitation of Study

The retrospective nature of this study makes it subject to recall bias and the low number of patients limits generalization of the results of this study.

Conclusion

In our experience, esophagectomy is done mostly for benign diseases than malignant esophageal diseases unlike what is obtainable in some centers across the globe particularly high-income countries/western institutions with high volumes of esophageal resections. Acceptable outcomes were recorded despite being a low-volume center and underscores the significant role of such centers in developing countries. It is important to individualize the treatment plan with particular attention to the nutritional needs of each patient.

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POA – Conceptualization of study, contribution of data, review and editing of manuscript and the corresponding author; **SOA** – Contribution of data, review and editing of manuscript; **CRE** – Collection and analysis of data, drafting and editing of manuscript; **ORA** – Data analysis and drafting of manuscript; **IO** – Data analysis and drafting of manuscript; **AAA** – Contribution of data and review of manuscript; **SAO** – Contribution of data and review of manuscript, **OAI** – Contribution of data and drafting of manuscript; **OAMA** – Contribution of data and review of manuscript.