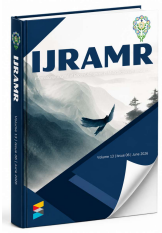
ISSN : 2350-0743

International Journal of Recent Advances in Multidisciplinary Research

Vol. 13, Issue 06, pp.12570-12573, June, 2026
https://doi.org/10.64485/ijramr.6591.06.2026



REVIEW ARTICLE

LOCAL FABRICATION AND CLINICAL USES OF MAGUARAN PLATE AND DRAFFIN BIPOID STAND IN ENUGU SOUTH EAST NIGERIA

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ARTICLE INFO

Article History:
Received 18th March, 2026
Received in revised form
27th April, 2026
Accepted 20th May, 2026
Published online 24th June, 2026

Keywords:

Magurans plate, Draffin bipod stand, Local fabrication, Tonsillectomy, ENT surgery, Nigeria.

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ABSTRACT

Background: Tonsillectomy remains one of the most frequently performed otorhinolaryngology procedures worldwide.Optimal surgical exposure during the procedure depends on specialized instruments such as maguaran plate and draffine bipod stand.The Maguaran plate and draffine bipod stand are indispensable tools for stabilizing the Boyle Davis month gag during tonsillectomy and similar Ear, Nose and threat (ENT) procedures. However, in low resource settings, access to standard surgical instruments such as Maguran plate and Draffin bipod stand is often limited due to cost and supply constraints. **Objective:** To describe the local fabrication process and evaluate the clinical effectiveness of locally fabricated Maguran plate and bipod stand used during tonsillectomy in Enugu, South East Nigeria. **Method:** A prospective descriptive study was conducted involving patients under going tonsillectomy using locally fabricated instruments in a secondary health facilty in Enugu, South East Nigeria.The fabricated devices were designed using stainless steel and modeled after standard Maguran plate and Draffin bipod stand.Locally fabricated Maguran plate and bipod stand were used to support the Boyle -Davis mouth gag.The instruments were tested in life surgical setting during tonsillectomy procedures on 50 patients at our ENT clinic. Outcome assessed included intraoperative stability, ease of use, operative time, complications, and surgeons satisfaction. **Result:** A total of 50 patients were included in the study.The locally fabricated Maguran plate and bipod stand provided adequate support for Boyle-Davis mouth gag, maintaining stable exposure throughout surgery. No significant intraoperative complications attributable to the devices were recorded. Surgeons reported satisfactory usability and comparable performance to standard instruments.The total cost of fabricated instrument was less than 10% of a standard imported equivalent. **Conclusion:** Locally fabricated Maguaran plates and Draffin bipod stands are cost effective, safe, and clinically effective alternatives for tonsillectomy in resources- limited settings. Wider adoption may improve surgical access in developing countries.

Citation: Anekpo Chijioke Chinedu, Nnadi Chinedu Gabriel and Nwosa chukwuma Nnamdi. 2026. "Local fabrication and clinical uses of Maguaran plate and Draffin Bipoid stand in Enugu South East Nigeria***", International Journal of Recent Advances in Multidisciplinary Research, 13,(06), 12570-12573.***

INTRODUCTION

Before modern suspension system, mouth gags used to keep mouth open and protect/position the endotracheal tube. During tonsillectomy an oropharyngeal tube has to be held by an assistant while the Surgeon operated. This made the assistant's hands unavailable and reduces fatigue and instability. The Boyle–Davismouthgagbecameastandard gag for tonsillectomy during the early 20th century but it still needs reliable suspension.[1] To free the assistants hand and stabilize the mouth gag, David Alexander Draffin designed a simple suspension system of two slender rods, the Draffin bipod often called Draffins rods or Draffin bipod. Draffin described and popularized the idea in the early 1950's. His rods became an accepted ENT instrument because they let the Boyle Davis' mouth gag to be suspended at an adjustable height and left both surgeons hands free. Historical reviews and biographical notes on Draffin recount the 1951 origin and the immediate practical uptake in tonsillectomy sets.[2] Magurans plate is a stainless- steel plate with a series of depression/holes along its edge. The lower ends of the two Draffin rods are placed into those depression on the Maguran plate to ensure that the mouth gag is secured and it is relatively opened. The plate and bipod combination is standard in contemporary tonsillectomy trays and it is described in surgical instrument lists in ENT text book.[3] The exact eponymic origin (ie. The person after whom Maguran is named) is not clearly documented in surgical literature meseum instrument catalogues and instrument manufactureris list the plates as "Magurans" but do not provide a clear biographical origin. [3] Since 1950s the Draffin bipod and Magurans plate set have been manufactured by numerous surgical instrument markers and had been included in tonsillectomy, adenoidectomy instrument sets. Had been

discussed both in technical papers and clinical trials that describe operative set up (for e.g. Contemporary adenoidectomy tonsillectomy papers and ENT instrument chapters). Modern instrument catalogues/medical suppliers still sell the bipod and plate as standard component.[4] Tonsillectomy remains one of the most frequent performed surgical procedure in Otorhinolaryngology practice world wide.It is indicated for recurrent tonsillitis obstructive sleep apnea due to tonsillar hypertrophy, pertonsillar abscess and suspected malignancy. Despite being a routine procedure successfully outcome depend ksignificantly on adequate surgical exposure and proper instrumentations .[5] The Boyle-Davis mouth gag, supported by the Draffine bipod stand and stabilized by Maguran plate, is widely regarded as the standard setup for achieving visualization of the oropharynx during tonsillectomy. This arrangement allows for hands- free retraction, improved surgical precision, and reduced surgeon fatigue. The Maguran plate specifically serves as a base support system that stabilizes Draffin bipod rods, allowing them to hold the mouth gag in a fixed position during surgery. This setup is critical for maintaining adequate visualization and ensuring surgical precision.[6]

Despite their importance, these instruments are often scarce or unaffordable in low- and middle- income countries (LMICs), including Nigeria. High costs, import dependence and limited supply chain contribute to inadequate surgical infrastructure. This challenge has prompted innovation in local fabrication of surgical tools. Local fabrication of medical devices has been recognized as a viable strategy to address equipment shortage in resources constrained environments. It promotes sustainability, reduces costs, and enhanced self reliance in health care systems. The global burden of surgical disease highlights the urgent need for innovative solution to improve access to safe surgical care.

The Lancet Commission on Global Surgery emphasized that billions of people lack access to essential surgical services, particularly in sub- Saharan Africa. One of the major barriers identified is the lack of appropriate surgical equipment. Local fabrication of medical devices has emerged as a viable and sustainable strategy to these challenges. By utilizing locally available materials and technical expertise, healthcare systems can reduce cost, improve availability and enhance self-reliance. In addition, locally fabricated can be customized to meet specific clinical needs. Despite these advantages, there is limited publish evidence evaluating the clinical performance of locally fabricated ENT surgical instruments. This study aims to describe the process of local fabrication of Maguran plate and Draffine bipod stand and to assess their effectiveness and safety in clinical use during tonsillectomy in Enugu, South East Nigeria.

MATERIALS AND METHODS

Study Design: This was a prospective descriptive study.

Study Setting: This study was conducted at Reggie ENT Clinic a secondary healthcare institution in Enugu, South East Nigeria, providingspecialized Otorhinolaryngological services.

Study Duration: The study was carried out over a period of one year (January 2024 to December 2025).

Study Population: All patients scheduled for tonsillectomy during the study period were eligible for inclusion.

Inclusion Criteria

- Patients with recurrent tonsillitis.
- Patients with tonsillar hypertrophy causing airway obstruction.
- Patients who gave informed consent

Exclusion Criteria

- Patients with known bleeding disorders.
- Patients requiring alternative surgical approaches.

FABRICATION Of Instruments: The Maguran plate and Draffin Bipod stand were locally fabricated using medical grade stainless steel by skilled technician in collaboration with ENT surgeon. The design replicated standard configurations described in ENT surgical practice.

Maguran Plate: The Maguran plate was designed as a flat rectangle metallic plate with strategically placed perforations. These perforations allow secure placement o the lower end of the bipod rods. The plate was constructed to provide stability when placed on the operating table .

Draffin Bipod stand: The bipod stand consisted of two vertical metallic rods with adjustable height mechanisms. Each rod was fitted with a ring support designed to hold the Boyle-Davis mouth gag. The bipod configuration allows for even distribution of weight and enhanced stability.

Quality Control: The fabricated instruments were inspected for structural integrity, smooth finishing, and proper alignment before use.

Sterilization Procedure and Safety: All fabricated instruments were sterilized using standard autoclaving techniques prior to each surgical procedure to ensure patients safety and prevent infection.

Surgical Procedure

All tonsillectomies were performed under general anesthesia using the standard dissection technique

The procedure involved:

- Proper patient positioning
- Insertion of Boyle- Davis mouth gag
- Fixation using the bipod stand and Maguran plate
- Dissection of tonsils
- Hemostasis

All procedures were performed by consultant otorhinolarynologist with assistance from trained surgical staff.

Outcome Measures

The following parameters were assessed:

- Stability of surgical exposure

- Ease of use of the fabricated instruments
- Operative time
- Intraoperative complications.
- Surgeon satisfaction

MATERIAL USED

- Stainless steel rods (12mm diameter, 40cm length)
- Stainless steel plate (20 x 15cmm) 4mm thickness) with 8 perforated holes for positioning rods.

FABRICATION SUPPORT

- A local metal worker with welding expertise
- Use of metal cutting end and grinding tools
- TIG welding was used to reinforce joints.

DESIGN CONSIDERATION

- Rods were designed to be inserted into the plate holes at an adjustable angle
- The system was designed to be sterilizable via autodave

CLINICAL USE

- **Setting:** ENT clinic in Enugu, Nigeria
- **Patient sample:** 50 patient undergoing tonsillectomy (age rang: 1 -55 year; 60% pediatric, 40% adult).
- **Use case:** Device was used to suspend the Boyle – Davis mouth gag.
- Evaluation Criteria
- Device stability during surgery
- Ease of assembly/disassembly
- Compatibility with existing gags
- Reusability and sterilization
- Subjective surgeon satisfaction

Data Analysis: Data were analyzed using Statistical Package for Social Sciences (SPSS) version 23. Results were presented as means, standard deviation, frequencies and percentages.

RESULTS

Demographic Characteristics

Table 1. Patient Demographics

Variable.	Numbers	Frequency (%)
Total patients	50	
Male.	29	58
Female.	21	42

Clinical Outcomes: The fabricated Maguran plate and bipod stand were successfully used in all procedures.

- Stable exposure achieved in 100% of cases.
- Mean operative time
- No device related complications recorded

Surgeon Satisfaction: Surgeon Satisfactory rating was excellent (100%). Surgeon reported high satisfaction particularly in terms of:

- Stability
- Ease of adjustment
- Reduced fatigue

Cost Analysis

Table 3. Cost Comparison

Instrument	Imported Cost ($)	Local Cost (₦)
Maguran Plate. &. Bipod Stand no	350.	38,000.

Figure 1. Locally Fabricated Maguran plate and bipod stand

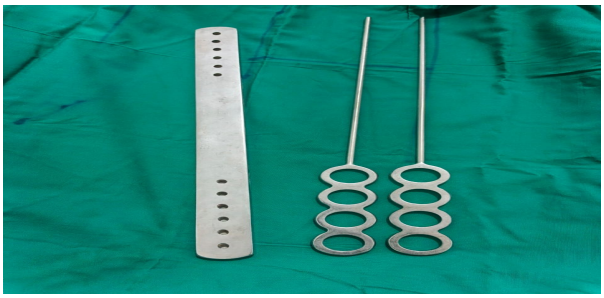

Figure 2. Factory manufactured Maguran plate and Bipod stand

Figure 3. Intraoperative use of locally manufactured Maguran plate and Bipod stand during tonsillectomy

Figure 4. Intraoperative use of Locally fabricated Maguran plate and bipod stand during tonsillectomy

DISCUSSION

This study demonstrates that locally fabricated Maguran plate and bipod stand can effectively substitute factory manufactured instruments in tonsillectomy. Adequate exposure during tonsillectomy is essential for surgical precision and safety. The combination of Boyle-Davis mouth gag with Draffin Bipod stand and Maguran plate is a well established technique that ensures optimal visualization. Locally fabricated version used in this study provided comparable stability and functionality. The importance of stable exposure during tonsillectomy cannot be overstated. The combination of Boyle Davis mouth gag with Draffin tripods and Maguran plate is a well established technique that ensures optimal visualization and access to the tonsilar fossa.[7] The locally fabricated version achieved comparable outcomes, with no increase in complications.

The absence of device related complications in this study supports the safety of these instruments. Additional level of surgeons satisfaction indicate that the devices are user friendly and further reinforces their clinical ability. In resources limited setting, however the availability of such instruments is often constrained. Previous studies have highlighted the need for cost effective innovations to improve surgical care delivery in LMICS [8]. The findings from this study aligns with global health strategies promoting local innovation in surgical care [9,10]. In resources limited setting such innovations are essential to improving access to safe surgery. This study is particularly relevant in Nigerian health care context where funding constraints and foreign exchange challenge limit access to imported medical equipment. Local fabrication offers sustainable solution by dependent external suppliers. One of the most important findings of this study is the significant cost reduction achieved through local fabrication. Imported surgical instruments are often expensive and difficult to procure in resource limited setting. The fabricated devices are affordable and readily available in most health facilities.

This approach is consistent with other innovation in surgical practice, where locally developed tools have successfully addressed gaps in healthcare delivery without compromising outcomes [11,12]. Local fabrication allows customization based on specific clinical needs which may not always be possible with standard imported instruments. Furthermore local innovation promotes capacity building and encourages collaboration between health care professionals and local artisans. The approach aligns with global health strategies aimed at strengthen systems in LMICs.

Implication For Practice

The adoption of locally fabricated surgical instruments has the potential to improve access to surgical procedures in resource limited settings. It can reduce delays, lower cost and enhance the overall efficiency of healthcare delivery.

Limitations

- Single center study.
- Limited sample size.
- Lack of long term follow up.
- Further studies should include multi centre trials and comparative analysis with standard instruments.

CONCLUSION

Locally fabricated Maguran plate and Draffin Bipod stand are safe, effective and affordable alternative to imported instruments for tonsillectomy. Their use can significantly enhance surgical capacity in resource limited setting. Further multi center studies are recommended to validate this findings and support policy integration.

Ethical Approval: Ethical Approval was obtained from Chairman Reggie Ear Nose and Throat Clinic Ethics Committee.

Funding: Nil

Conflict of Interest: None declared

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