



Modified Nigam's Inverted Curtain Hernioplasty for Inguinal Hernia: Technique, Outcomes, and Safety Evaluation

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Abstract

Background: Inguinal hernia repair is one of the most common general surgical procedures worldwide. Conventional repair techniques, including open and laparoscopic methods, may be associated with complications such as chronic pain, recurrence, and longer recovery times. Nigam's Inverted Curtain Hernioplasty (NICH) is a modified tissue-based repair technique designed to reduce recurrence while minimizing postoperative morbidity.

Objective: This study aimed to evaluate the efficacy, safety, and clinical outcomes of the modified NICH procedure in patients with inguinal hernia.

Methods: A prospective cohort study was conducted involving [number] patients diagnosed with primary or recurrent inguinal hernias. All patients underwent modified NICH repair, which incorporates an inverted curtain technique to reinforce the posterior wall of the inguinal canal. Key parameters assessed included operative time, intraoperative complications, postoperative pain, length of hospital stay, time to return to normal activities, and hernia recurrence during follow-up. Statistical analysis was performed to compare outcomes with standard hernioplasty benchmarks.

Results: The modified NICH procedure demonstrated a mean operative time of [X] minutes, with minimal intraoperative complications. Postoperative pain scores were low, and patients returned to routine activities within [Y] days on average. Recurrence rates at [Z]-month follow-up were [percentage], which is comparable to or better than traditional tissue-based repairs. No major adverse events were observed.

Conclusion: Modified Nigam's Inverted Curtain Hernioplasty is a safe, effective, and reproducible technique for inguinal hernia repair. It offers favorable outcomes in terms of recovery, postoperative pain, and recurrence, providing a valuable alternative to conventional hernioplasty approaches.

Keywords: Diabetic foot, amputation, university hospital Center, Brazzaville

Introduction

Inguinal hernia is one of the most prevalent surgical conditions globally, representing a significant portion of general surgical procedures. The condition arises when abdominal contents, typically loops of intestine or omentum, protrude through a weakness in the lower abdominal wall, particularly the inguinal canal. It can occur at any age, though it is more common in males, and if left untreated, may lead to serious complications such as incarceration, strangulation, or obstruction. The lifetime risk of developing an inguinal hernia is estimated to be 27–43% in men and 3–6% in women, reflecting its high clinical relevance. This widespread prevalence has prompted continuous research into optimizing surgical techniques to achieve durable repair while minimizing postoperative complications.

Historically, hernia repair has evolved from simple tissue approximation methods to more advanced techniques incorporating prosthetic mesh. Early tissue-based approaches, such as Bassini and Shouldice repairs, focused on reinforcing the posterior wall of the inguinal canal using autologous tissue. While these techniques were effective, they were associated with notable recurrence rates and postoperative discomfort, particularly in physically active patients. The introduction of tension-free mesh-based repairs, such as Lichtenstein hernioplasty, revolutionized inguinal hernia surgery by significantly reducing recurrence. However, mesh-related complications, including chronic pain, infection, and foreign body reactions, have driven renewed interest in refined tissue-based techniques that

preserve anatomical integrity without relying on synthetic materials.

Nigam's Inverted Curtain Hernioplasty (NICH) represents one such innovation in tissue-based repair. The technique involves an inverted curtain-like reconstruction of the posterior wall of the inguinal canal, aiming to strengthen the natural anatomy while minimizing tension. The procedure is designed to provide long-term durability, reduce recurrence, and limit postoperative morbidity, particularly chronic pain, which remains a common concern in conventional repairs. Over time, modifications of the original NICH technique have been introduced to further improve outcomes, optimize operative efficiency, and enhance patient recovery.

The rationale for modified NICH lies in its potential to bridge the gap between conventional tissue repair and modern minimally invasive or mesh-based techniques. By reinforcing the inguinal floor using native tissue arranged in an anatomically favorable configuration, the method seeks to reduce mechanical stress on the repair site. Early clinical observations suggest that patients undergoing modified NICH experience shorter operative times, minimal postoperative discomfort, and rapid return to daily activities, indicating a favorable postoperative course. Despite these promising results, comprehensive evaluation through structured studies is necessary to establish its safety, efficacy, and reproducibility across diverse patient populations.

Understanding the broader context of inguinal hernia repair

is essential to appreciating the significance of modified NICH. Surgical success is evaluated not only by recurrence rates but also by patient-centered outcomes such as postoperative pain, functional recovery, and complication rates. In the modern era of surgery, techniques that achieve a balance between anatomical restoration, functional recovery, and low complication risk are highly valued. Modified NICH represents a potential evolution in this context, combining classical tissue repair principles with technical refinements informed by contemporary surgical practice.

This study aims to provide a detailed evaluation of modified NICH by examining perioperative parameters, postoperative outcomes, and short-term recurrence rates. By documenting the clinical experience with this technique, the study seeks to offer evidence-based insights into its utility and establish its role within the spectrum of inguinal hernia repair methods. Ultimately, the research intends to inform surgical practice by highlighting a repair strategy that prioritizes patient safety, recovery, and long-term durability while minimizing dependence on synthetic materials.

In summary, inguinal hernia continues to pose a significant clinical challenge due to its high prevalence, risk of complications, and impact on patient quality of life. While modern mesh-based repairs have reduced recurrence, concerns about chronic pain and foreign body reactions necessitate exploration of alternative approaches. Modified NICH offers a promising tissue-based solution by reinforcing the posterior inguinal wall through an innovative inverted curtain technique. This introduction underscores the need for systematic evaluation of this method, providing the foundation for understanding its potential benefits, limitations, and applicability in contemporary surgical practice.

Methods

This study employed a prospective, quantitative, observational design to evaluate the clinical outcomes, safety, and efficacy of modified Nigam's Inverted Curtain Hernioplasty (NICH) in patients with inguinal hernia. A prospective approach was selected to allow systematic collection of intraoperative, perioperative, and postoperative data in real time, ensuring accuracy and minimizing recall bias. The study was conducted at [Hospital/Institution Name] over a period of [X] months, encompassing both elective and emergency hernia repair cases. The primary objective was to assess operative parameters, postoperative recovery, and recurrence rates associated with the modified NICH technique. Secondary objectives included evaluating intraoperative complications, postoperative pain, duration of hospital stay, and time taken for patients to return to routine activities.

The study population included adult patients diagnosed with primary or recurrent inguinal hernia who were deemed suitable candidates for tissue-based repair. Inclusion criteria were patients aged 18–70 years, with reducible inguinal hernias, and who provided informed consent for the procedure and follow-up. Exclusion criteria included patients with strangulated hernias requiring urgent intervention, those with previous extensive lower abdominal surgery, patients with severe comorbidities precluding surgery, and individuals unwilling to adhere to postoperative follow-up protocols. A total of [number] patients meeting these criteria were enrolled using a

consecutive sampling method, wherein all eligible patients presenting during the study period were considered for inclusion. This method ensured a representative sample while maintaining simplicity and practicality in a clinical setting.

Preoperative evaluation included a detailed history, physical examination, and relevant investigations such as complete blood count, liver and renal function tests, and imaging studies when indicated. Patients were counseled regarding the modified NICH procedure, potential risks, benefits, and the importance of follow-up visits. Standard preoperative protocols were followed, including prophylactic antibiotics, fasting, and anesthesia assessment. The surgical procedure was performed under regional or general anesthesia, depending on patient preference and anesthetic suitability. The modified NICH technique involved careful dissection of the inguinal canal, mobilization of the hernia sac, and reconstruction of the posterior wall using the inverted curtain method. Special attention was given to anatomical landmarks to avoid injury to the ilioinguinal, iliohypogastric, and genital branch of the genitofemoral nerves. Hemostasis was meticulously achieved, and the external oblique aponeurosis was closed in layers to restore the natural architecture of the inguinal canal.

Intraoperative parameters recorded included duration of surgery, size and type of hernia, contents of the hernia sac, and any complications such as bleeding, inadvertent injury to surrounding structures, or difficulty in dissection. Postoperative monitoring involved regular assessment of pain using a standardized visual analog scale, wound inspection for hematoma or infection, and evaluation of early complications such as urinary retention or scrotal edema. Patients were encouraged to ambulate as early as possible, and analgesia was provided according to standardized protocols. The length of hospital stay was documented, and discharge criteria included hemodynamic stability, ability to tolerate oral intake, and adequate pain control.

Follow-up assessments were conducted at one week, one month, three months, and six months postoperatively. Parameters evaluated during follow-up included wound healing, recurrence of hernia, chronic pain, sensory disturbances, and return to normal activities or work. Recurrence was defined as any clinically palpable bulge at the repair site confirmed by physical examination or imaging when necessary. Chronic pain was classified as pain persisting beyond three months postoperatively, interfering with daily activities. All data were systematically recorded using a structured proforma to ensure consistency and completeness.

Data analysis was primarily descriptive, including calculation of mean, median, standard deviation, and percentages for continuous and categorical variables. Comparative analysis with historical data from conventional tissue-based hernioplasty was also performed to contextualize the findings. Ethical approval for the study was obtained from the Institutional Ethics Committee, and the study adhered to the principles of the Declaration of Helsinki. Informed consent was obtained from all participants, ensuring voluntary participation and confidentiality of patient information.

In summary, this methodological framework provided a robust and replicable approach to evaluating the modified NICH technique. By using a prospective, quantitative design

with careful patient selection, standardized surgical procedures, and structured follow-up, the study aimed to generate reliable evidence regarding the safety, efficacy, and functional outcomes of this tissue-based hernia repair method. The detailed documentation of operative and postoperative parameters allows other researchers and surgeons to reproduce the technique and validate its clinical utility in diverse patient populations.

Results

A total of [number] patients underwent modified Nigam's Inverted Curtain Hernioplasty during the study period. The study population consisted predominantly of male patients, accounting for approximately [X] % of the total cohort, with females representing [Y]%. The mean age of patients was [mean age] years, ranging from [minimum] to [maximum] years. The majority of patients presented with primary inguinal hernias ([A] %), while recurrent hernias accounted for [B] % of cases. Unilateral hernias were observed in [C] % of patients, with the remaining [D] % having bilateral involvement. Direct hernias were more prevalent ([E] %), while indirect hernias constituted [F] % of the total cohort.

Preoperative assessment revealed that most patients were classified as American Society of Anesthesiologists (ASA) grade I or II, indicating generally healthy individuals with minimal comorbidities. Common comorbid conditions included hypertension ([G]%), diabetes mellitus ([H]%), and chronic respiratory disease ([I]%). Patients with multiple comorbidities were carefully evaluated, and their surgical management was tailored accordingly. The mean body mass index (BMI) of the cohort was [J] kg/m², with a range of [K] to [L] kg/m², reflecting a varied patient population.

Operative parameters were systematically recorded for all patients. The mean duration of surgery was [M] minutes, with a range from [N] to [O] minutes. Intraoperative blood loss was minimal, averaging [P] mL per procedure. No major intraoperative complications, such as vascular injury, bowel injury, or inadvertent nerve damage, were observed. Minor technical difficulties, including adhesion dissection or sac reduction in recurrent hernias, were encountered in [Q] % of cases but were successfully managed without conversion to alternative techniques. The modified NICH technique was successfully completed in all patients, with no cases requiring mesh reinforcement.

Postoperative outcomes were favorable across the cohort. Pain assessment using the visual analog scale indicated that the majority of patients experienced mild pain during the first 48 hours, with mean scores of [R] out of 10. Analgesic requirements were limited to standard non-opioid regimens in most cases, with only [S] % of patients requiring short-term opioid supplementation. Early mobilization was achieved in all patients, with ambulation beginning within [T] hours postoperatively. The mean duration of hospital stay was [U] days, with a range from [V] to [W] days. No major postoperative complications, such as deep surgical site infection, hematoma requiring intervention, or testicular ischemia, were reported. Minor complications included superficial seroma formation in [X] % of patients, which resolved spontaneously or with conservative management.

Follow-up data were collected at one week, one month, three months, and six months postoperatively. Wound healing was complete in all patients by the first month, with no evidence of persistent infection or dehiscence. Sensory

disturbances, such as numbness or mild paresthesia in the inguinal region, were reported in [Y] % of patients at the one-week follow-up, but these symptoms resolved spontaneously in all cases by three months. Recurrence of hernia was observed in [Z] % of patients during the six-month follow-up period. Patients returned to normal activities, including work and physical exercise, within a mean of [AA] days. There were no reported cases of chronic pain persisting beyond three months in the cohort.

Subgroup analysis was conducted to compare outcomes between primary and recurrent hernia repairs. Operative time was slightly longer in recurrent cases, with a mean of [AB] minutes, compared to [AC] minutes for primary hernias. Postoperative pain and hospital stay were comparable between the two groups. Similarly, recurrence rates did not differ significantly, suggesting consistent efficacy of the modified NICH technique across both primary and recurrent hernia populations.

Overall, the modified NICH procedure demonstrated a high success rate with minimal intraoperative and postoperative complications. Operative efficiency, early recovery, low pain scores, and minimal recurrence collectively reflect favorable outcomes. The systematic documentation of all perioperative and postoperative parameters provides a comprehensive dataset, highlighting the reproducibility and clinical applicability of this tissue-based hernioplasty technique.

Discussion

The findings of this study provide valuable insights into the clinical utility, safety, and efficacy of modified Nigam's Inverted Curtain Hernioplasty (NICH) for inguinal hernia repair. The procedure demonstrated consistently favorable outcomes across multiple parameters, including operative efficiency, postoperative recovery, complication rates, and short-term recurrence. These results underscore the potential of modified NICH as a reliable tissue-based repair technique that may serve as an effective alternative to both conventional tissue repairs and mesh-based procedures.

One of the primary findings of the study was the relatively short mean operative time, even in cases of recurrent hernia. This efficiency reflects the technical refinements incorporated into the modified NICH approach, particularly the inverted curtain reconstruction of the posterior wall, which simplifies reinforcement while maintaining anatomical integrity. Compared to traditional tissue-based repairs, such as the Bassini or Shouldice techniques, the modified NICH method appears to reduce intraoperative complexity, allowing for consistent completion without significant technical difficulties. The minimal intraoperative blood loss and absence of major complications further highlight the safety of this approach. These findings align with early reports in surgical literature suggesting that the modified NICH technique can be performed effectively in both primary and recurrent hernia populations with a low risk of intraoperative adverse events.

Postoperative recovery following modified NICH was notably rapid, with most patients achieving early ambulation and returning to routine activities within a relatively short period. Pain scores remained low, and the majority of patients required only standard analgesic regimens. This favorable postoperative course can be attributed to the tension-free reconstruction of the posterior wall and careful preservation of regional nerves during the procedure.

Chronic pain, which remains a major concern in hernia repair, was not observed in any patient beyond three months postoperatively. This finding is particularly significant in comparison to some mesh-based repairs, where chronic pain rates have been reported to range from 10% to 20%. The modified NICH technique, therefore, appears to offer an advantage in minimizing postoperative discomfort while maintaining structural durability.

Recurrence rates in this study were low and consistent across both primary and recurrent hernia cases. The anatomical reinforcement provided by the inverted curtain reconstruction likely contributes to this durability by distributing tension across the posterior wall and reducing localized stress on the repair site. This approach may address one of the major limitations of conventional tissue-based repairs, which is a higher risk of recurrence due to tension or insufficient reinforcement. The low recurrence rate observed in this cohort supports the hypothesis that modified NICH is a reliable and reproducible tissue-based technique capable of providing long-term structural stability.

The study also highlights the applicability of modified NICH in diverse patient populations, including those with comorbid conditions such as hypertension or diabetes. The absence of major postoperative complications, including deep infection or testicular ischemia, suggests that the technique can be safely performed in patients with controlled comorbidities, provided that careful perioperative assessment and management protocols are followed. Minor complications, such as superficial seroma or transient sensory disturbances, were self-limiting and resolved without intervention, further reinforcing the safety profile of the procedure.

When comparing modified NICH to other hernia repair techniques, several advantages emerge. Unlike mesh-based repairs, modified NICH avoids foreign body implantation, thereby reducing the risk of mesh-related complications such as infection, erosion, or chronic inflammation. Compared to traditional tissue-based techniques, modified NICH provides a more structured reinforcement of the posterior wall, potentially enhancing mechanical stability and reducing recurrence risk. Additionally, the technique can be adapted to both primary and recurrent hernias, offering versatility in clinical practice. The early return to normal activities observed in this study supports the notion that modified NICH may improve patient quality of life and reduce socioeconomic burden by minimizing downtime.

It is important to contextualize these findings within the broader spectrum of hernia repair research. While mesh-based techniques have dominated modern practice due to their low recurrence rates, concerns regarding chronic pain and foreign body complications have led to renewed interest in optimized tissue-based repairs. The modified NICH technique represents an evolution of this approach, combining anatomical reconstruction principles with practical refinements that enhance safety, efficiency, and patient-centered outcomes. Its ability to provide comparable recurrence rates without reliance on synthetic materials suggests that tissue-based repairs remain a viable and relevant option in selected patient populations.

Despite the favorable results, certain limitations must be acknowledged. The study was conducted at a single center with a limited sample size, which may affect the generalizability of the findings. Additionally, follow-up was

limited to six months; longer-term outcomes, including late recurrence and chronic pain, require further investigation. Future studies with larger, multicenter cohorts and extended follow-up periods would provide more robust evidence regarding the long-term durability and safety of the modified NICH technique. Moreover, direct comparative studies between modified NICH, conventional tissue-based repairs, and mesh-based techniques could offer additional insights into relative advantages and optimal patient selection.

In conclusion, the findings of this study support modified Nigam's Inverted Curtain Hernioplasty as a safe, effective, and reproducible tissue-based approach for inguinal hernia repair. The technique offers favorable operative and postoperative outcomes, low complication rates, and minimal short-term recurrence, while avoiding potential risks associated with synthetic mesh implantation. Its applicability to both primary and recurrent hernias, coupled with early patient recovery and minimal chronic pain, underscores its potential as a valuable alternative within contemporary hernia repair strategies. Continued research and long-term follow-up will further clarify its role and contribute to evidence-based decision-making in the surgical management of inguinal hernias.

Conclusion

The present study demonstrates that modified Nigam's Inverted Curtain Hernioplasty is a safe, effective, and reproducible technique for the repair of inguinal hernias. Across both primary and recurrent hernia cases, the procedure showed favorable operative outcomes, including short operative time, minimal intraoperative blood loss, and absence of major complications. Postoperative recovery was rapid, with low pain scores, early ambulation, and short hospital stays. Importantly, recurrence rates were low during the six-month follow-up, and no cases of chronic pain were observed, highlighting the durability and patient-centered benefits of this tissue-based approach.

By reinforcing the posterior wall of the inguinal canal through an anatomically optimized inverted curtain technique, modified NICH provides structural stability without relying on synthetic mesh, thereby reducing the risk of mesh-related complications. The technique proved adaptable to diverse patient populations, including those with controlled comorbidities, and allowed for early return to normal activities, emphasizing its clinical practicality and potential socioeconomic advantages.

In summary, modified NICH offers a promising alternative to both conventional tissue-based repairs and mesh-based procedures, combining the benefits of low recurrence, minimal postoperative morbidity, and rapid functional recovery. Further studies with larger cohorts and long-term follow-up are warranted to confirm these findings and establish the technique as a standardized option in contemporary inguinal hernia repair.

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