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Handmade *vs.* commercial transobturator slings for female stress urinary incontinence: A matched retrospective cohort study of clinical outcomes and cost analysis

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SUMMARY

Background and aim: Urinary incontinence affects 27% of Egyptian women, with economic barriers limiting access to commercial slings. This study evaluated whether handmade polypropylene slings are as effective and safe as commercial systems, serving as a cost-effective alternative.

Patients and methods: This retrospective study included 52 matched women (40-75 years) with primary SUI who received either a commercial or a handmade transobturator sling placed at a private tertiary care hospital in Cairo, Egypt, from July 2020 to May 2022. Outcomes included objective/subjective success, ICIQ-SF scores, complications, and pad usage, assessed over 12 months.

Results: Both groups demonstrated equivalent outcomes across all measures. The handmade sling group required a longer mean operative time (39.9 vs. 34.9 minutes, p=0.032), but no other significant differences were observed in objective (84.6% vs. 80.8%, p=0.714) or subjective success rates (80.8% vs. 76.9%, p=0.735), daily pad usage (1.4 vs. 1.5 pads/day, p=0.673), catheterization time (23.2 vs. 24.8 hours, p=0.482), or complication rates (3.8% vs. 7.7%, p=0.556). Multivariate analysis confirmed sling type was not predictive of success (aOR: 1.12, p=0.564). The handmade sling was 78.6% less expensive per device ($30 vs. $140) than the commercial system.

Conclusion: Handmade polypropylene slings achieve clinical outcomes equivalent to commercial systems despite a modest increase in operative time, offering a safe, effective, and cost-efficient alternative for stress urinary incontinence management.

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INTRODUCTION

Urinary incontinence represents a significant and often overlooked health burden in Egypt, where economic constraints intersect with medical needs. The EPIC study revealed that 27% of Egyptian adultwomenexperience urinary incontinence, with isolatedstress urinary incontinence affecting 6% of womenpopulation [1]. This high prevalence translates to millions of Egyptians struggling with bladder control issues, yet few seek medical attention due to economic and cultural barriers. A study at an Egyptian primary health center further confirmed the substantial impact of urinary incontinence on women's daily lives [2]. The substantial rate of incontinence, coupled with limited healthcare resources and high poverty levels, creates an urgent need for cost-effective treatment solutions that can be widely implemented within both public and private healthcare sectors.

The economic landscape in Egypt amplifies the need for affordable medical solutions, as out-of-pocket healthcare expenditures constitute a substantial portion of household spending for many families. The transobturator sling procedure, while established as an effective treatment for stress urinary incontinence, becomes practically inaccessible when relying exclusively on expensive commercial systems. Handmade polypropylene mesh slings emerge as a particularly relevant solution in this context, with the safety of polypropylene mesh across different procedures established in previous studies, at a cost approximately one-tenth that of commercial alternatives while maintaining similar surgical principles [3,4]. This cost differential becomes especially critical in a country where urinary incontinence significantly affects physical performance and quality of life among the elderly [5], and where economic pressures often force patients to choose between necessary medical treatments and other essential needs [6].

This study addresses Egypt's specific socioeconomic context by evaluating whether handmade slings can provide comparable outcomes to commercial systems while dramatically reducing costs. Previous research has demonstrated that modified sling techniques can effectively address persistent incontinence after conventional procedures [7], supporting the potential of alternative surgical approaches. The high prevalence

of stress urinary incontinence (6% in adult women) combined with economic constraints necessitates innovative approaches to healthcare delivery [1]. By demonstrating similar efficacy and safety profiles to commercial slings [6,7], this research could significantly expand treatment accessibility for Egyptian women suffering from stress urinary incontinence, potentially transforming incontinence management across the country's healthcare system.

PATIENTS AND METHODS

This retrospective comparative study took place at a private tertiary care hospital in Cairo, Egypt from July 2020 to May 2022. The aim was to compare two surgical materials for managing Stress Urinary Incontinence (SUI) in women aged 40-75 years who were undergoing their first midurethral sling procedures. The research team used a cohort design to evaluate the effectiveness of commercial transobturator tape slings compared with hand-made polypropylene slings. Patient recruitment involved a careful review of surgical databases, and data collection included thorough examinations of electronic medical records, operative reports, and follow-up documentation. With a minimum follow-up period of 12 months per participant, the study included participants from diverse backgrounds across Egypt's private healthcare sector, ensuring consistency in surgical standards and postoperative care throughout the study. All procedures were performed by a dedicated urogynecology team using standardized techniques, thereby maintaining methodological integrity across both groups.

Participants

Between July 2020 and May 2022, women aged 40 to 75 with SUI were recruited from gynecology and urology clinics at a private hospital in Cairo. To participate, women had to have confirmed incontinence, no prior surgery for the condition, and a willingness to attend follow-up assessments. Those with mixed or urgency incontinence, pelvic organ prolapse surgery, neurological issues, or those unsuited for sling procedures were excluded.

The selection process involved a careful review of surgical databases and clinic records to ensure fairness. Participants were monitored through scheduled visits at 1, 3, 6, and 12 months after surgery, along with phone interviews and validated questionnaires to collect comprehensive data. In this matched study, two groups were formed based on the type of sling used: 26 received a commercial sling and 26 a handmade sling. Each pair was matched for age, menopausal status, obstetric history, body mass index, and severity of incontinence before the procedure (**Tab. 1.**).

Preoperative assessment and patient selection

The clinical pathway commenced with a thorough preoperative assessment, which included gathering detailed medical and obstetric-gynecological histories, with a focus on characteristics of incontinence, such as duration and severity. All patients underwent a standardized clinical examination that involved a cough stress test, pelvic organ prolapse quantification (POP-Q) [8], and neurologic assessments. Patients were required to complete validated questionnaires, like the ICIQ-SF, to evaluate symptoms and quality of life. Inclusion demanded confirmed primary isolated stress urinary incontinence without previous anti-incontinence surgery; exclusion removed those with mixed incontinence, neurologic issues, or concurrent prolapse requiring repair.

Surgical procedure and immediate postoperative care

All procedures were performed under spinal anesthesia with antibiotic prophylaxis using first generation cephalosporin one hour before surgery. The transobturator

Tab. 1. Participant characteristics, exposure data, and follow-up information.

Characteristic	Commercial Sling Group (n=26)	Hand-made Sling Group (n=26)	p-value
Demographic Data			
Age (years)	48 ± 6	47 ± 5	0.521[a]
BMI (kg/m²)	30.2 ± 3.1	30.4 ± 2.9	0.803[a]
Menopausal status	12 (46.2%)	11 (42.3%)	0.777[b]
Obstetric History			
Number of pregnancies	3.2 ± 1.4	3.1 ± 1.3	0.782[a]
Vaginal births	2.8 ± 1.1	2.7 ± 1.0	0.721[a]
Cesarean sections	6 (23.1%)	5 (19.2%)	0.735[b]
Clinical Characteristics			
Preoperative pad use	22 (84.6%)	21 (80.8%)	0.714[b]
Number of pads/day	4.1 ± 2.0	3.8 ± 1.7	0.542[c]
Recurrent UTI	8 (30.8%)	7 (26.9%)	0.756[b]
Preoperative dyspareunia	7 (26.9%)	6 (23.1%)	0.752[b]
Exposure Data			
Operative time (min)	34.9 ± 7.5	39.9 ± 8.2	0.032[a]
Follow-up Information			
Average follow-up (months)	22.6 ± 12.3	21.8 ± 11.7	0.798[c]

a=Student's t-test, b=Chi-square test or Fisher's exact test, c=Mann-Whitney U test Fisher's exact test was used when expected cell frequencies were <5. Data presented as mean ± standard deviation or n (%) BMI=Body Mass Index; SUI=Stress Urinary Incontinence; UTI=Urinary Tract Infection; VLPP=Valsalva Leak Point Pressure

approach followed the Elgamasy technique [9], using either commercial sling systems (düzey svt, düzey Medikal, Turkey) or hand-made slings crafted from low-density, macroporous, monofilament polypropylene mesh (Promesh T; Surgical-IOC, France), measuring 1.2 × 30 cm (**Fig. 1.- Fig. 3.**), using a fine-tipped cautery. This melts the monofilament's edge, creating a smooth border that mimics the heat-sealed edges of commercial tapes, preventing sawing during passage and erosion. For handmade slings, meshes were cut along the least elastic direction, incorporating six sewing lines, and were prepared aseptically immediately before implantation (**Fig. 2.**). The surgical technique involved bilateral transobturator passage using TOT needles. Operative time was recorded from incision to closure. Postoperative protocol included indwelling catheterization for 24 hours, followed by a trial of voiding with measurement of postvoid residual volume. Patients were discharged after successful voiding with residual volume <100 mL, with standardized analgesia and instructions for gradual resumption of activities.

Outcome evaluation and follow-up protocol

Structured follow-up assessments occurred at 1, 3, 6, and 12 months postoperatively. Each visit included a clinical examination, stress testing with a standardized bladder volume (300 mL), and administration of a comprehensive questionnaire.

Primary outcomes

Objective success was measured through a negative standardized stress test with full urinary bladder (requiring voiding ≥200 mL for validity), while subjective success was evaluated using:

a- Patient Global Impression of Improvement (PGI-I) [10]: A single-item questionnaire asking patients to rate their improvement since surgery on a 7-point scale from "very much worse" to "very much better," with responses of "very much better" or "much better" indicating success.

b- Visual Analog Scale (VAS) for satisfaction [9]: A 10-cm horizontal line scale anchored with "not satisfied at all" (0) and "completely satisfied" [11], where scores ≥ 8 defined success.

Secondary outcomes

International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF) [12]: Administered preoperatively and at 1, 3, 6, and 12 months postoperatively to quantify symptom severity and impact on quality of life (scores range 0–21, higher scores indicating worse incontinence).

Clavien-Dindo classification of surgical complications [13]: Used to grade complications from I (minor) to V (death) based on clinical documentation. Vaginal infections were recorded in three patients (2 in Handmade arm and 1 in commercial slings arm) and treated by antibiotics and vaginal hygiene measures.

Pad usage diaries: Patients recorded daily pad number/type for 3 days prior to each follow-up visit.

Dyspareunia assessment: Evaluated *via* a binary (yes/no) questionnairesupplemented by a 5-point Likert scale for severity [14] at 6 and 12 months.

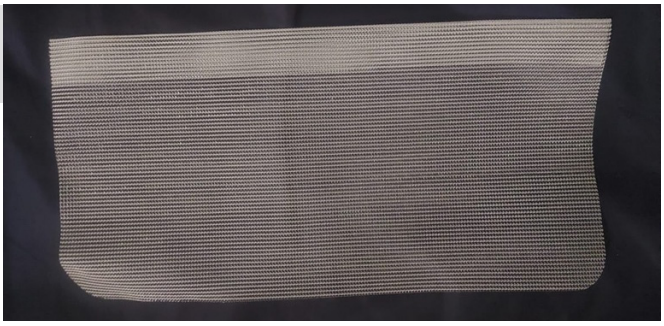

Fig. 1. Promesh T polypropylene mesh 30 × 30cm.

Fig. 2. Handmade TOT tape.

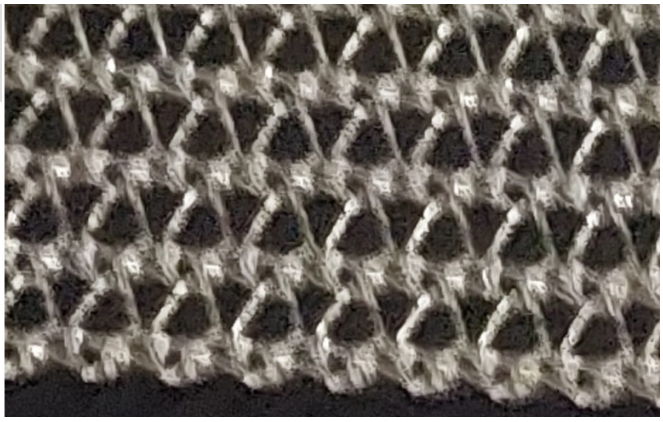

Fig. 3. Close view showing a clean cut smooth borders.

Urinary Tract Infection (UTI) history: Captured through patient interviews and medical record review at each follow-up.

These measures provided comprehensive insights into procedural efficiency, safety, functional outcomes, and quality of life.

Long-term monitoring and final assessment

The 12-month visit served as the primary endpoint for determining the outcome, incorporating all previously described evaluations, plus an additional quality-of-life assessment. The assessment integrated both objective and subjective criteria, requiring concordance between the negative stress test and patient-reported improvement. Those with persistent stress incontinence were offered alternative treatments following comprehensive counseling. All data were collected using standardized case report forms and entered into a secure database for analysis. The follow-up protocol ensured complete documentation of both positive outcomes and complications, providing robust data for comparative analysis between the two sling types while maintaining patient safety through systematic monitoring throughout the study period.

Sample size justification

For our retrospective study comparing commercial *vs.* hand-made TOT slings in a private Egyptian hospital, we calculated that a minimum of 52 patients (26 per group) would provide 80% power to detect clinically significant differences at α=0.05, based on the previous study's success rates [4] (approximately 85-90% in both groups) and standard deviations. This calculation accounts for the minimal clinically important difference of 15% in success rates between groups, which would be meaningful for clinical decision-making.

Addressing potential sources of bias

Several methodological strategies were implemented to minimize potential biases throughout the study. Selection bias was addressed through consecutive patient recruitment and clear, pre-defined eligibility criteria applied uniformly to all participants. Performance bias was mitigated by having all procedures performed by the same surgical team using standardized techniques, with only the sling type varying between groups. Detection bias was reduced by implementing blinded outcome assessment where feasible—particularly for objective stress tests, which were conducted by clinicians unaware of the sling type used. Recall bias was minimized by using structured, validated questionnaires administered at standardized intervals. To address confounding, statistical adjustment was performed for known predictors, including age, BMI, menopause status, and preoperative incontinence severity. The matched study design itself helped control for important baseline characteristics, while prospective data collection using standardized forms ensured consistent measurement across all time points.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics, Version 28.0. Continuous normally distributed variables were analyzed using independent-samples t-tests, while non-normally distributed or ordinal data were assessed with the Mann-Whitney U test. Categorical variables were compared using Chi-square or Fisher's exact tests. Multivariate logistic regression was employed to evaluate the independent effect of sling type on treatment success while controlling for demographic, obstetric, and clinical variables. All tests were two-tailed, with $p<0.05$ considered statistically significant. A comparative cost analysis of the sling devices was performed based on direct material acquisition costs.

RESULTS

The demographic and clinical characteristics presented in **Tab. 1.** demonstrate excellent baseline comparability between the two treatment groups, indicating successful matching procedures. The handmade sling group had a modestly longer mean operative time than the commercial group (39.9 *vs.* 34.9 minutes, p=0.032), attributable to the additional time required for mesh preparation and customization. However, both techniques showed equivalent outcomes across all other surgical and postoperative parameters. The absence of statistically significant differences across all measured variables ensures that any observed outcomes can be reasonably attributed to the intervention rather than pre-existing disparities. This methodological strength enhances the validity of subsequent comparative analyses between commercial and handmade slings.

Cost Analysis Given the equivalent clinical outcomes demonstrated between the two techniques, a comparative cost analysis was performed. The only significant cost differential was the price of the sling device itself. The handmade polypropylene sling (Promesh T) carried a material cost of $30 per procedure. In contrast, the commercial sling system (düzey svt) cost $140 per procedure. This represents a direct cost saving of $110 (78.6%) per procedure when using the handmade sling, without compromising clinical efficacy or safety.

Tab. 2. reveals comparable outcomes between the two surgical approaches. Both commercial and hand-made slings demonstrated equivalent results across all measured parameters, with no statistically significant differences observed. Catheterization times were similar between groups (23.2 *vs.* 24.8 hours, p=0.482), indicating comparable postoperative recovery patterns. Objective outcomes showed near-identical pad usage patterns, with both groups reporting similar proportions of patients using pads postoperatively (19.2% *vs.* 23.1%, p=0.735) and comparable daily pad quantities (1.4 *vs.* 1.5 pads/day, p=0.673). Safety metrics remained consistently equivalent, including operative time, complication rates, and urinary tract infections.

Tab. 3. demonstrates equivalent clinical outcomes between the two surgical approaches. Both commercial and hand-made slings showed comparable success rates across all measured parameters, with no statistically significant differences observed in objective success (80.8% *vs.* 84.6%, p=0.714), subjective success (76.9% *vs.* 80.8%, p=0.735), or patient satisfaction measures (73.1% *vs.* 76.9%, p=0.752). The groups were well-matched preoperatively, with similar baseline symptom severity (ICIQ-SF 18.2 *vs.* 18.7, p=0.483), and both achieved equivalent postoperative symptom improvement (13.4 *vs.* 14.4 points, p=0.528).

The multivariate logistic regression analysis in **Tab. 4.** provides a comprehensive assessment of factors influencing treatment success. By simultaneously controlling for multiple potential confounders—including demographic characteristics, obstetric history, clinical factors, and procedural variables—this analysis offers a robust evaluation of the independent effect of sling type. The results demonstrate no significant association between sling type (hand-made *vs.* commercial) and treatment success (aOR: 1.12, 95% CI: 0.76-1.65, p=0.564), indicating equivalent efficacy after accounting for other influential factors. Furthermore, none of the examined demographic, clinical, or procedural variables showed statistically significant associations with outcomes. This multivariate approach confirms the equipoise between the two techniques established in the univariate analyses, providing strong evidence that clinical outcomes are comparable across sling types when other patient and procedural factors are considered.

Tab. 5. presents a direct financial comparison between two types of surgical slings. It displays the device cost for a commercial sling ($140) and a handmade alternative ($30), resulting in a cost difference of -$110. It shows the difference as a percentage, showing a 78.6% cost saving when using the handmade sling.

Tab. 2. Comparison of perioperative and postoperative outcomes between commercial and handmade sling groups.

Surgical Data			
Operative time (min)	34.9 ± 7.5	39.9 ± 8.2	0.032[a]
Length of stay (days)	1.2 ± 0.4	1.1 ± 0.3	0.312[a]
Intraoperative complications	0	0	-
Time with catheter (hours)	24.8 ± 8.6	23.2 ± 7.9	0.482[a]
Postoperative Clinical Data			
Follow-up (months)	22.6 ± 12.3	21.8 ± 11.7	0.798[c]
Use of pads	6 (23.1%)	5 (19.2%)	0.735[b]
Postoperative Complications			
Vaginal infections	1 (3.8%)	2 (7.6%)	0.304[b]
Number of pads/day	1.5 ± 0.9	1.4 ± 0.8	0.673[c]
Urinary tract infection	3 (11.5%)	4 (15.4%)	0.691[b]
Dyspareunia	4 (15.4%)	1 (3.8%)	0.157[b]
a=student's t-test, b=Chi-square test or Fisher's exact test, c=Mann-Whitney U test, Statistically significant (p<0.05)			

Tab. 3. Success rates and patient-reported outcomes at 12-month follow-up.

Outcome Measure	Commercial Sling (n=26)	Hand-made Sling (n=26)	p-value
Objective Success	21 (80.8%)	22 (84.6%)	0.714[a]
Subjective Success (PGI-I)	20 (76.9%)	21 (80.8%)	0.735[a]
ICIQ-SF pre	18.2 ± 2.8	18.7 ± 2.5	0.483[b]
ICIQ-SF post	4.8 ± 5.2	4.3 ± 4.9	0.724[c]
ICIQ-SF improvement	13.4 ± 6.1	14.4 ± 5.8	0.528[c]
Satisfaction (VAS ≥ 8)	19 (73.1%)	20 (76.9%)	0.752[a]
PGI-I (scores 1 and 2)	20 (76.9%)	21 (80.8%)	0.735[a]
a=Chi-square test or Fisher's exact test, b=Student's t-test, c=Mann-Whitney U test, Statistically significant (p<0.05)			

Tab. 4. Multivariate analysis of factors associated with treatment success at 12 months.

Variable	Adjusted Odds Ratio	95% Confidence Interval	p-value
Sling Type			
Hand-made *vs.* Commercial	1.12	0.76-1.65	0.564
Demographic Factors			
Age (per 5-year increase)	0.94	0.82-1.08	0.387
BMI (per 5 kg/m² increase)	0.88	0.72-1.07	0.198
Postmenopausal status	1.05	0.78-1.41	0.743
Obstetric Factors			
Vaginal deliveries (≥ 2 *vs.* <2)	1.18	0.89-1.56	0.256
Cesarean sections (any *vs.* none)	0.92	0.71-1.19	0.521
Clinical Factors			
Preoperative pad use (yes *vs.* no)	0.85	0.63-1.15	0.289
Preoperative ICIQ-SF (per 5-point increase)	0.91	0.78-1.06	0.217
Recurrent UTI history	0.96	0.73-1.27	0.782
Procedure Factors			
Operative time (per 10-minute increase)	1.03	0.92-1.15	0.634
Postoperative complications	0.87	0.59-1.28	0.478

Tab. 5. Comparative cost analysis.

Cost Component	Commercial Sling	Handmade Sling	Difference
Sling device cost	$140	$30	-$110
Cost saving (%)	-	-	78.6%

DISCUSSION

Our results and their interpretation

Based on a comprehensive analysis of well-matched patient cohorts, our results demonstrate clinical equipoise between handmade polypropylene slings and commercial systems. Both techniques achieved equivalent outcomes across all measured parameters, with no statistically significant differences in postoperative catheterization time (23.2 *vs.* 24.8 hours), pad usage patterns (1.4 *vs.* 1.5 pads/day), success rates (84.6% *vs.* 80.8% objective success), or patient satisfaction measures (76.9% *vs.* 73.1% VAS $\geq$ 8). Our results demonstrate that handmade polypropylene slings achieve clinical outcomes equivalent to those of commercial systems across all measured parameters, except for a modestly longer operative time (approximately 5 minutes) required for mesh preparation and customization. This slight increase in surgical time represents a reasonable trade-off given the substantial cost savings and equivalent efficacy and safety profiles. Safety profiles were maintained, as operative times, complication rates, and hospital stays remained comparable between groups.

These findings suggest that both sling techniques effectively manage stress urinary incontinence. The multivariate analysis confirmed that sling type was not a significant predictor of treatment success (aOR: 1.12, 95% CI: 0.76-1.65, p=0.564) after accounting for demographic, obstetric, and clinical factors. Comparable catheterization times and voiding recovery patterns indicate similar tissue responses and healing processes. Additionally, both groups demonstrated similar improvements in quality of life and reductions in symptom burden, as reflected in comparable ICIQ-SF score improvements (14.4 *vs.* 13.4 points).

These results have significant implications for global incontinence management, especially in healthcare systems with economic constraints. By demonstrating equivalent efficacy and safety, our study validates the handmade sling as a clinically non-inferior and cost-effective alternative. The substantial cost savings of handmade slings—approximately one-tenth the price of commercial options—help address financial barriers preventing treatment access for millions of women worldwide. This approach represents a sustainable healthcare innovation that maintains high clinical standards while expanding access to treatment.

Comparison of our results to similar studies

Lourenço, et al. [4] conducted a retrospective cohort study with 57 women (31 in commercial slings, 26 in handmade slings) and highlighted significant baseline imbalances, including the proportion of genuine SUI (16.1% *vs.* 38.5%, p=0.057). Their methodology used standard statistical comparisons without adjusting for covariates, showing equivalent operative times and complication rates, with subjective success rates of 74.2% *vs.* 80.2% (p=0.556). They noted a trend toward fewer pads with handmade slings (1.0 *vs.* 1.9, p=0.097). In contrast, our study employed a matched design and multivariate analysis, revealing no significant differences in pad usage (1.4 *vs.* 1.5 pads/day, p=0.673) or success rates (84.6% *vs.* 80.8%, p=0.714).

Unlike Ben-Zvi, et al.'s [6] prospective single-surgeon study that compared three sling types with significant baseline disparities, our methodology utilized a rigorously matched cohort design focusing solely on transobturator techniques with handmade *vs.* commercial slings, ensuring baseline equivalence (all p>0.05). While Ben-Zvi, et al. reported higher complication rates with the handmade Composix sling, our findings indicated similar safety profiles (3.8% *vs.* 7.7% complications, p=0.556) and comparable efficacy in pad usage reduction (1.4 *vs.* 1.5 pads/day, p=0.673) and catheterization times (23.2 *vs.* 24.8 hours, p=0.482). This demonstrates that modern handmade sling techniques can achieve outcomes equivalent to commercial options.

Our methodology significantly improved upon Ciftci, et al.'s [15] by using a meticulously matched cohort design instead of non-concurrent historical groups, which introduced baseline differences. Our results showed equivalent efficacy between handmade and commercial TOT slings, with comparable success rates (84.6% *vs.* 80.8%, p=0.714) and pad usage patterns (1.4 *vs.* 1.5 pads/day, p=0.673). Additionally, our multivariate analysis confirmed that sling type was not an independent predictor of success (aOR: 1.12, p=0.564) after controlling for potential confounders, reinforcing the evidence of clinical equivalence.

Brito, et al. (2011) [16] used a non-randomized, comparative design based on healthcare settings, introducing selection bias due to institutional and socioeconomic confounding. Their 90-day assessment showed equivalent short-term outcomes and no complications—an atypical finding in sling surgery. In contrast, our study employed a rigorously matched cohort design with a 12-month follow-up, confirming comparable safety profiles (3.8% *vs.* 7.7% complications, p=0.556) and equivalent functional outcomes in daily pad usage (1.4 *vs.* 1.5 pads/day, p=0.673) and patient satisfaction (76.9% *vs.* 73.1%, p=0.752). Our multivariate analysis strengthens their conclusion, establishing the handmade sling as a viable, cost-effective alternative to commercial systems.

Clinical Implications of our study

Our study demonstrates that handmade polypropylene slings achieve outcomes equivalent to those of commercial systems in terms of safety, efficacy, and patient satisfaction for stress urinary incontinence. This evidence, combined with a 78.6% reduction in direct device cost, supports the use of handmade slings as a clinically effective and highly cost-efficient alternative, directly reducing economic barriers to care. With comparable success rates and complication profiles, handmade slings offer a sustainable solution for resource-limited settings, potentially expanding treatment access globally without compromising quality. The additional operative time required for handmade slings—approximately 5 minutes—is clinically insignificant relative to overall surgical duration

and does not affect patient safety or postoperative recovery. This minor time investment supports the viability of handmade slings as a cost-effective alternative, particularly in settings where economic constraints limit access to commercial systems.

Strengths and limitations of the study

The study's strengths include a rigorously matched cohort design that ensures baseline comparability and the use of standardized, validated outcome measures with a comprehensive 12-month follow-up. Multivariate analysis confirmed that the techniques yielded equivalent outcomes after controlling for confounders. However, its limitations include a single-center, retrospective design; an inadequate sample size to robustly compare complication rates; a sample size of 26 per group, which may be underpowered for rare complications; an inability to assess long-term durability; alongside the lack of a formal comprehensive cost-effectiveness analysis which would include indirect costs; our analysis was limited to direct device acquisition costs; and potential performance bias.

Recommendations for further studies

Future multicenter trials with ≥ 5-year follow-up are needed to validate the durability and complications of handmade slings. Cost-effectiveness analyses should quantify economic benefits. Research must standardize surgical techniques, include diverse populations and surgeon experiences, and optimize patient selection through subgroup analyses for prior failed cases.

CONCLUSION

Handmade polypropylene slings achieve clinical outcomes equivalent to commercial systems despite a modest increase in operative time, offering a safe, effective, and highly cost-efficient alternative for stress urinary incontinence management, particularly valuable in resource-limited settings.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This retrospective cohort study was reviewed and approved by the Institutional Review Board of the private hospital. Due to the retrospective nature of the study, which involved analysis of pre-existing anonymized clinical data, the IRB granted a waiver of individual informed consent. All patient identifiers were removed prior to analysis to ensure confidentiality and privacy. The study protocol adhered to local and national guidelines for retrospective electronic health record reviews.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIAL

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

COMPETING INTERESTS

The authors declare no conflict of interest.

FUNDING

This research received no external funding.

AUTHORS CONTRIBUTIONS

All authors jointly contributed to the conception and design of the study.

Ahmed Wali : Design of the study, revision of results, data analysis.

Rana Nasr: Revision of results and data analysis.

Munirah Mohammed BinMosa: Revision of results and data analysis.

Kareem El-Attar: Design of the study, performed the operations,

Kariem El-Atriby: Revision of the manuscript, statistical analysis, manuscript writing.

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Not applicable.

CONSENT FOR PUBLICATION

Not applicable.

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