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COMPARING STAGED COMPREHENSIVE RECONSTRUCTION AND SELECTIVE STEP-WISE SURGERY IN FTM TRANSITION: SURGICAL, SEXUAL, AND PSYCHOLOGICAL OUTCOMES

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Abstract

Background: Female-to-male (FTM) gender-affirming surgery involves coordinated endocrine, psychological, and surgical interventions to align physical characteristics with affirmed gender identity. In India, increasing acceptance of gender diversity has led to greater demand for such care; however, comparative outcome data for different surgical pathways remain limited. **Objectives:** This study compares surgical, functional, psychosocial, sexual, and endocrine outcomes between two surgical pathways among FTM individuals: a combined staged approach versus a selective or step-wise approach. Methods: This multi-centre retrospective cohort study included 61 female-to-male (FTM) individuals who underwent gender-affirming surgical procedures at tertiary-level gender surgery units between 2021 and 2025. Group A underwent a combined staged pathway, including hysterectomy with or without bilateral salpingo-oophorectomy, top surgery, and phalloplasty in a single or planned two-stage sequence. Group B underwent selective or step-wise procedures, such as isolated top surgery, selective reproductive organ removal, delayed or omitted phalloplasty. Outcomes assessed included hysterectomy technique (laparoscopic vs vaginal), extent of top and bottom surgery, organ-preservation decisions, postoperative complications, sexual and marital function, psychological outcomes (PHQ-9, GAD-7, Gender Congruence and Life Satisfaction Scale), and long-term testosterone-related effects.

Results: Group A demonstrated shorter overall transition timelines, higher gender congruence scores, and greater completion of masculinizing reconstruction, but had higher early postoperative complication rates, particularly following phalloplasty. Laparoscopic hysterectomy was associated with reduced blood loss, shorter hospital stay, and faster recovery compared to vaginal hysterectomy. Retention of ovaries (salpingectomy alone) reduced hypoandrogenic symptoms during interruptions in testosterone therapy but was associated with higher dysphoria related to organ retention. Phalloplasty significantly improved sexual satisfaction and penetrative function,

while its omission resulted in fewer urological complications. Long-term testosterone therapy (>3 years) produced predictable metabolic changes without major cardiovascular events. Psychological well-being improved significantly in both groups, though marital adjustment challenges were common during postoperative and hormonal stabilization phases. **Conclusion:** Combined staged reconstruction offers superior gender congruence, sexual outcomes, and psychological satisfaction, albeit with increased perioperative morbidity. Surgical and endocrine decisions should be individualized, supported by integrated psychological care and culturally sensitive counselling to optimize holistic outcomes for FTM individuals in India.

INTRODUCTION

Gender incongruence, defined as a marked and persistent incongruence between an individual's experienced gender and sex assigned at birth, is now recognised as a health condition that warrants access to gender-affirming medical and surgical care rather than pathologisation of identity itself. The World Professional Association for Transgender Health (WPATH) Standards of Care, Version 8 (SOC-8) emphasise a multidisciplinary, patient-centred approach to gender-affirming interventions that include hormonal therapy, mental health support, and surgery tailored to individual needs and goals.[1] In this framework, female-to-male (FTM) or transmasculine individuals are offered a spectrum of "core" masculinising procedures such as chest masculinisation (top surgery), hysterectomy, salpingo-oophorectomy, vaginectomy and genital reconstruction (phalloplasty and urethral lengthening), often in combination with long-term testosterone therapy.[1,2] India hosts a large and heterogeneous transgender population. Census 2011 data identified approximately 4.88 lakh persons under the "others" category, though community-based estimates suggest under-enumeration and a true burden likely approaching 4.8 million.[3,4] Subsequent analyses highlight substantial regional variation and social disadvantage, with literacy, employment, and health indicators lagging behind national averages.[3,5] In response to long-standing activism and the landmark NALSA judgment, legal frameworks such as the Transgender Persons (Protection of Rights) Act, 2019, have formally recognised the right to self-identified gender and mandated non-discrimination in education, employment and health care, including access to gender-affirming services.[6 to 8] Nevertheless, implementation gaps, stigma, and fragmented clinical pathways continue to limit timely and comprehensive gender-affirming care, particularly for transmasculine people whose needs have historically received less visibility than transfeminine individuals.[2,9] From a clinical standpoint, gender-affirming surgery (GAS) is now widely regarded as a medically necessary component of care for many individuals with gender incongruence or gender dysphoria, playing a pivotal role in alleviating psychological distress and improving quality of life.[10] Narrative and systematic reviews consistently demonstrate that GAS including chest masculinisation and genital reconstruction is associated with significant reductions in depression, anxiety, suicidality and gender dysphoria, alongside improvements in body image, social functioning and overall health-related quality of life.[11–14] Recent longitudinal and cross-sectional work from high-income countries shows that access to gender-affirming interventions, including surgery, leads to sustained gains in self-esteem, global functioning and life satisfaction.[15- 17] A recent analysis of patient-reported outcomes across a spectrum of gender-affirming surgeries documented improvements in gender expression, quality of life, self-esteem and mental health in over 88–94% of participants.[17] Sexual health and intimate relationships represent additional key domains of outcome after gender-affirming interventions. Available evidence suggests that transgender individuals frequently report sexual dysfunction and distress prior to transition, often related to gender dysphoria, avoidance of gendered body parts and internalised stigma.[13,18] A 2024 review on sexual function after gender-affirming surgery noted that transmasculine individuals often experience improved sexual activity, satisfaction and body comfort after masculinising chest and genital procedures, although domains such as desire and arousal may show mixed trajectories depending on hormonal exposure, surgical configuration and partner dynamics.[13,18,19] A 2025 synthesis of non-facial gender-affirming surgeries similarly concluded that hormonal therapy generally enhances desire and arousal, while surgery

particularly phalloplasty and urethral lengthening tends to improve sexual satisfaction and capacity for partnered sexual activity, even though residual sexual concerns may persist in a subset.[19] Despite this, data specifically addressing marital relationships, partnership stability, and culturally situated sexual outcomes among FTM individuals in low and middle-income settings remain scarce. The Indian literature on gender affirmation has expanded in recent years but remains relatively limited in volume and often heterogeneous in methodology. A comprehensive narrative review from a large-volume gender identity clinic summarised current knowledge on gender incongruence and gender-affirming surgeries in India, underscoring the centrality of multidisciplinary care and highlighting the under-representation of transmasculine patients in published cohorts;[2] earlier reports from Indian endocrine clinics described small series of FTM individuals, focusing on treatment preferences and short-term outcomes. In a retrospective study of 18 FTM subjects from an endocrinology clinic in eastern India, approximately 39% had undergone hysterectomy and oophorectomy, whereas only a minority proceeded to phalloplasty, which was regarded as the "ultimate" step in surgical transition.[20] These data reflect both structural constraints (cost, availability of expertise) and patient-level choices about the desired extent of surgical masculinisation. Plastic surgery series from Indian centres – usually reporting mixed cohorts of transmasculine and transfeminine clients – have primarily focused on procedural volumes, perioperative complications and global quality-of-life changes, with encouraging improvements in physical, psychological and social domains after surgery.[21], [22] However, these studies seldom disaggregate outcomes by specific surgical pathways in FTM individuals. Core masculinising surgical procedures for trans men can be conceptualised along three axes: (i) chest masculinisation, (ii) removal or preservation of internal reproductive organs, and (iii) genital reconstruction.[2],[10],[23] Chest masculinisation (reduction mammoplasty or double-incision mastectomy with nipple–areola complex grafting) is often prioritised early, given its large impact on gender expression and daily functioning.[2],[23] Hysterectomy with or without bilateral salpingo-oophorectomy is considered medically necessary for those who desire removal of internal reproductive organs for reasons of gender dysphoria, menstrual suppression, cancer-risk reduction or to simplify hormonal regimens.[1],[23],[24] Finally, genital reconstruction in the form of metoidioplasty and/or phalloplasty, with or without urethral lengthening, seeks to provide a neophallus capable of enabling voiding while standing, sexual intimacy and – in some configurations – penetrative intercourse.[10],[23] Within this surgical continuum, there is substantial variation in sequencing, combination and technical approach. Hysterectomy in transmasculine patients may be performed via vaginal, conventional laparoscopic, laparoscopy-assisted vaginal or robot-assisted routes. A recent review concluded that conventional laparoscopic hysterectomy remains widely used and demonstrates favourable safety and efficacy profiles in FTM patients, although vaginal and robotic approaches are increasingly reported.[25] A comparative study of laparoscopic versus vaginal hysterectomy performed as part of gender affirmation surgery found both routes to be feasible, with differences in blood loss, operative time and convalescence, suggesting that route selection may be individualised based on anatomy, previous surgery and surgeon expertise.[26] Robot-assisted total laparoscopic hysterectomy with bilateral salphingo- oophorectomy combined with colpectomy has been shown to be feasible as a single-step procedure in FTM transition, facilitating vaginal closure and preparing tissues for subsequent phalloplasty.[27] Beyond surgical route, there is also debate regarding the timing of hysterectomy relative to phalloplasty. A 2022 analysis comparing patients who underwent concurrent hysterectomy at Stage 1 phalloplasty with those who had asynchronous hysterectomy reported higher neourethral complication rates in the asynchronous group, raising the possibility that a combined approach may offer urological advantages in selected candidates.[28] An additional clinical decision concerns the extent of gonadal removal—complete hysterectomy with bilateral salpingo-oophorectomy versus hysterectomy with salpingectomy alone, leaving ovaries in situ. WPATH SOC-8 and expert guidelines recognise hysterectomy with or without oophorectomy and/or salpingectomy as medically necessary options in transmasculine individuals and stress that decisions should be informed by cancer-risk profiles, fertility desires, age and the anticipated hormonal regimen.[1],[23],[24] Some centres and consensus groups have suggested that retaining ovaries

may buffer against hypoandrogenic states during interruptions in testosterone therapy, while others emphasise the advantages of oophorectomy in simplifying endocrine regimens and mitigating dysphoria associated with retained "female" organs.[24],[29] Indian endocrine consensus statements similarly recommend maintaining physiological sex-steroid levels and monitoring for reproductive organ malignancy when ovaries or uterus are retained, while acknowledging that surgical removal of natal gonads allows lower maintenance doses of exogenous hormones.[29] These divergent perspectives highlight the need for empirical data on how organ-preservation versus complete removal influences long-term physical, psychological and sexual outcomes in FTM individuals. The choice to pursue or forgo phalloplasty is perhaps the most defining – and debated – element in FTM surgical planning. Phalloplasty techniques (radial forearm free flap, anterolateral thigh flap, and other pedicled or free flaps) offer the possibility of a sensate neophallus and standing micturition but are associated with substantial operative time, costs, donor-site morbidity, urethral complications and need for staged procedures.[10],[23] International series and systematic reviews indicate that phalloplasty yields high levels of satisfaction with penile size and appearance, along with the ability to engage in penetrative sexual intercourse in many patients, but urethral fistulae and strictures remain frequent complications.[10],[30] Some patients prefer metoidioplasty or chest-only surgery without genital reconstruction, prioritising relief from chest dysphoria and social "passability" over the risks and burdens of major genital surgery.[10],[23] Early Indian experiences and clinical reports suggest that cost, access to specialised microsurgical expertise and social invisibility of trans men have contributed to relatively low uptake of phalloplasty, although detailed comparative data are lacking.[2], [20] and [21] Hormonal therapy with testosterone forms the endocrine backbone of FTM transition and interacts closely with surgical decision-making. Long-term testosterone therapy induces virilisation (deepening of voice, facial/body hair, increased muscle mass), ceases menses in most individuals, and contributes to positive effects on gender congruence and sexual desire.[18],[24] At the same time, multiple observational studies and systematic reviews have documented predictable metabolic and haematological effects, including polycythaemia, changes in lipid profile, weight gain, mild hepatic enzyme elevation and potential cardiovascular risk, necessitating ongoing monitoring.[24],[31] A recent review of psychological and physical health outcomes associated with gender-affirming hormone therapy concluded that, for transmasculine individuals, benefits to mental health and quality of life are substantial, while adverse events are generally manageable when therapy is supervised using guideline-based monitoring.[24] The balance between maintaining adequate testosterone levels for mental and sexual well-being and mitigating long-term metabolic risks becomes especially pertinent when ovaries are removed, rendering individuals entirely dependent on exogenous hormones. Despite this evolving global evidence base, several gaps remain, particularly in relation to FTM individuals in the Indian context. First, most Indian series have small sample sizes, combine transmasculine and transfeminine patients, and focus predominantly on descriptive demographic profiles, procedural volumes or immediate perioperative outcomes.[2],[21],[22],[32] Disaggregated analysis of FTM cohorts, especially with regard to the interaction between surgical pathway (combined vs step-wise), specific technical options (laparoscopic vs vaginal hysterectomy, oophorectomy vs salpingectomy alone), inclusion or omission of phalloplasty, and multidimensional outcomes (psychological state, marital adjustment, sexual function, and endocrine safety) is conspicuously limited. Secondly, there is a dearth of data on marital and sexual life of FTM individuals post-surgery in conservative, family-centric societies such as India, where relational dynamics, disclosure, fertility concerns and legal constraints on marriage and assisted reproduction may all influence satisfaction with surgical outcomes.[4],[6],[33] Finally, while studies from high-income settings have begun to explore whether combined "one-stage" surgical pathways confer advantages over sequential or partial approaches, comparative evidence from resource-constrained settings, where cost and access heavily shape treatment trajectories, is minimal.[25–28],[30]

In this context, systematically studying a cohort of FTM individuals who have undergone gender-affirming surgery in an Indian tertiary-care setting offers an opportunity to address several clinically relevant questions. Specifically, comparing two groups – one following a combined or staged

comprehensive pathway (including hysterectomy with or without bilateral salpingo-oophorectomy, top surgery and phalloplasty in a planned sequence) and another undergoing selective or step-wise procedures (such as chest-only surgery, organ-preserving hysterectomy or delayed/no phalloplasty) can illuminate how these choices influence surgical morbidity, psychological well-being, marital and sexual functioning, and the long-term safety profile of testosterone therapy. By integrating data on surgical techniques (laparoscopic vs vaginal hysterectomy), organ-preservation strategies (oophorectomy vs salpingectomy alone), and inclusion or omission of phalloplasty with validated measures of mental health, life satisfaction and sexual outcomes, such a study can provide context-specific evidence to guide shared decision-making. Therefore, the present study was undertaken to compare surgical, psychological, sexual and endocrine outcomes between two distinct surgical pathways in a cohort of 61 FTM individuals undergoing gender-affirming surgery at a tertiary centre. The findings are expected to contribute to the sparse Indian literature on FTM transition, inform multidisciplinary counselling, and support the development of evidence-based, culturally sensitive protocols for gender-affirming surgical care.

METHODS

Study Design and Setting: This multi-centre retrospective cohort study included 61 female-to-male (FTM) individuals who underwent gender-affirming surgical procedures at tertiary-level gender surgery units between 2021 and 2025 which provided multidisciplinary care for transgender and gender-diverse individuals. The centres at Ramaiah Memorial Hospital, Leena Hospital and Neha Prakash Hospital, Bangalore offered integrated endocrinology, mental-health, and plastic surgery, gynaecology, and urology services, following WPATH SOC-8 protocols. This multicentre study period extended from **January 2021 to December 2025**, during which **61 consecutive female-to-male (FTM) individuals** underwent one or more gender-affirming surgical procedures. An Institutional Ethics Committee approval was obtained prior to data extraction. All procedures conformed to the Declaration of Helsinki.

Study Population

Inclusion criteria

1. Individuals assigned female at birth that identified as male/transmasculine.
2. Underwent at least one gender-affirming surgical procedure at the centre during the study period.
3. Completed a minimum of **12 months of testosterone therapy** prior to surgery (as per SOC-8 recommendations), unless contraindicated.
4. Underwent preoperative psychological assessment and clearance from a qualified mental-health professional.
5. Available postoperative follow-up data for at least **12 months**.

Exclusion criteria

1. Individuals who discontinued hormonal therapy before surgery for non-medical reasons.
2. Those with incomplete or missing operative or follow-up records.
3. Patients who underwent surgery at an external centre and returned only for follow-up.

Grouping Strategy: Comparative Cohorts

Participants were categorised into two predefined groups based on their surgical pathway:

Group A – Combined / Comprehensive Pathway

Patients who underwent:

- Top surgery (subcutaneous mastectomy) **AND**
- Hysterectomy ± salpingo-oophorectomy **AND**
- Bottom surgery (metoidioplasty/phalloplasty)
  in a **single-stage or planned multi-stage sequence** over a continuous transition timeline.

Group B – Selective / Step-wise Pathway
Patients who underwent:
- Only top surgery, **or**
- Organ-preserving hysterectomy with salpingectomy alone (ovaries retained), **or**
- Delayed / no bottom surgery, **or**
- Multiple surgeries separated by long intervals based on patient preference, access, or medical constraints.

This grouping allowed comparative evaluation of surgical morbidity, psychological outcomes, sexual function, and long-term endocrine effects.

Data Collection Procedures
Data were extracted from hospital medical records, operative notes, anaesthetic charts, urology/plastic surgery logs, endocrinology follow-up sheets, and structured mental-health assessments. All information was anonymised prior to analysis.

1. Sociodemographic variables
- Age at first surgery
- Education, occupation
- Relationship/marital status
- Duration of gender dysphoria prior to presentation
- Duration of testosterone therapy

2. Surgical variables
a. Type of hysterectomy
- Laparoscopic hysterectomy (LH)
- Laparoscopy-assisted vaginal hysterectomy (LAVH)
- Vaginal hysterectomy (VH)
- Robot-assisted hysterectomy (where applicable)

b. Adnexal management
- Bilateral salpingo-oophorectomy (BSO)
- Salpingectomy alone (ovarian preservation)

c. Chest surgeries
- Double-incision mastectomy with free nipple graft
- Keyhole/periareolar approach
- Revision surgery rates

d. Genital reconstruction
- Mastoidioplasty
- Phalloplasty (radial forearm free flap, anterolateral thigh flap)
- With or without urethral lengthening
- One-stage vs two-stage procedures

e. Complications
Assessed using **Clavien–Dindo classification**, including:
- Haemorrhage
- Infection
- Seroma/haematoma
- Nipple/areola necrosis
- Urethral fistula or stricture
- Donor-site morbidity
- Need for reoperation

Psychological and Quality-of-Life Assessment

Pre- and postoperative psychological outcomes were evaluated using validated instruments widely used internationally and recommended in transgender health research:

1. **PHQ-9** – Patient Health Questionnaire for depressive symptoms
2. **GAD-7** – Generalised Anxiety Disorder Scale
3. **Gender Congruence and Life Satisfaction Scale (GCLS)**
4. **Body Image Scale (BIS)**

Scores were collected preoperatively and at **6 months and 12 months** postoperatively.

Sexual and Marital Life Assessment

Sexual functioning was assessed using:

- **The Brief Sexual Function Inventory (BSFI)** for transmasculine individuals
- Questions on desire, arousal, lubrication, orgasm consistency, dyspareunia, and satisfaction
- Specific items regarding penetrative sexual function for patients undergoing phalloplasty

Marital/relationship outcomes were evaluated using:

- Structured interviews
- Self-reported partner satisfaction
- Disclosure status
- Perceived intimacy and relational adjustment after surgery

Endocrine and Metabolic Monitoring

Testosterone therapy parameters included:

- Dose, route (IM/SC), and frequency
- Serum testosterone levels (peak and trough)
- Serum estradiol
- Haemoglobin/haematocrit levels
- Fasting lipid profile
- Liver function tests
- Fasting glucose, HbA1c
- Blood pressure and weight changes

Polycythaemia was defined as haematocrit ≥ 54%, following Endocrine Society guidelines.

Complications assessed included:

- Dyslipidaemia
- Polycythaemia
- Hypertension
- Hepatic enzyme elevation
- Menstrual breakthrough (pre-hysterectomy)
- Ovarian cyst formation (in ovary-preserving group)

Outcome Measures

Primary outcomes

1. **Psychological improvement** (change in PHQ-9, GAD-7, GCLS scores)
2. **Gender satisfaction and body image outcomes**
3. **Sexual function and satisfaction**
4. **Postoperative complication rates**

Secondary outcomes

1. Route-specific perioperative outcomes (laparoscopic vs vaginal hysterectomy)
2. Effect of ovarian preservation vs oophorectomy
3. Influence of inclusion/exclusion of phalloplasty on sexual and relational life
4. Endocrine therapy safety profile over 12 months

Statistical Analysis

Data analysis was performed using **SPSS version 27.0** (IBM Corp., Armonk, NY, USA).

Continuous variables
- Reported as mean ± standard deviation (SD) or median (IQR)
- Compared using paired or unpaired *t*-test for normally distributed data
- Mann–Whitney U test for non-parametric data

Categorical variables
- Expressed as proportions (%)
- Compared using Chi-square test or Fisher's exact test

Multivariate analysis
A binary logistic regression model assessed predictors of:
- Psychological improvement
- Sexual satisfaction
- Postoperative complications

Independent variables included route of hysterectomy, presence of phalloplasty, type of adnexal management, testosterone duration, age, and baseline psychological scores.

Significance level
A p-value < 0.05 was considered statistically significant.

Ethical Considerations
- Institutional Ethics Committee approval obtained (Reference No. RMHRC/ 2021-25 dated 01.01.2021).
- Patient confidentiality preserved throughout data collection and analysis.
- All patients had previously provided informed consent for medical and surgical care; waiver of consent for retrospective analysis was granted by IEC.
- No external funding was received

RESULTS

1. Baseline Characteristics

A total of **61 FTM individuals** were included in the analysis. Of these, **32 (52.5%)** were categorised under **Group A** (Combined/Comprehensive Pathway) and **29 (47.5%)** under **Group B** (Selective/Step-wise Pathway). The mean age at first surgery was **26.8 ± 4.9 years**, with no significant difference between Group A (26.2 ± 4.4) and Group B (27.5 ± 5.3) (p = 0.29). The median duration of gender dysphoria prior to presentation was **7 years (IQR 5–10)**. All patients had received testosterone therapy for at least 12 months before surgery.

Table 1. Baseline Demographic and Clinical Profile

Variable	Group A (n = 32)	Group B (n = 29)	p-value
Age at surgery (years)	26.2 ± 4.4	27.5 ± 5.3	0.29
Duration of dysphoria (years)	7.1 ± 3.2	7.5 ± 3.6	0.63
Testosterone therapy duration (months)	18.6 ± 6.1	20.2 ± 7.2	0.27
Preoperative PHQ-9 score	14.2 ± 4.6	13.9 ± 4.4	0.78
Preoperative GAD-7 score	12.6 ± 4.3	12.9 ± 4.2	0.81
In a marital/committed relationship	17 (53.1%)	14 (48.3%)	0.68

There were no statistically significant baseline differences between the two groups.

2. Surgical Procedures Performed

2.1 Hysterectomy Approach

A total of **54/61 (88.5%)** underwent hysterectomy.
- **Laparoscopic hysterectomy (LH):** 36 patients (66.7%)

- **Vaginal hysterectomy (VH):** 14 patients (25.9%)
- **Robot-assisted hysterectomy:** 4 patients (7.4%)

Laparoscopic hysterectomy showed significantly shorter operative time and reduced blood loss:

Parameter	LH (n=36)	VH (n=14)	p-value
Operative time (minutes)	82.3 ± 16.5	112.6 ± 20.4	<0.001
Estimated blood loss (ml)	93 ± 38	142 ± 51	0.002
Hospital stay (days)	2.1 ± 0.7	3.8 ± 1.1	<0.001
Perioperative complications	3 (8.3%)	4 (28.6%)	0.04

LH had significantly fewer complications.

2.2 Adenexal Management

- **Bilateral salpingo-oophorectomy (BSO):** 38 patients (62.3%)
- **Salpingectomy only (ovarian preservation):** 16 patients (26.2%)
- **No adnexal surgery:** 7 patients (11.5%)

Patients retaining ovaries showed fewer symptoms during temporary interruptions of testosterone ($p = 0.03$), but reported higher residual gender dysphoria ($p = 0.04$).

2.3 Chest Masculinisation Surgery

All 61 patients underwent top surgery.

Type of top surgery	Frequency	Complications
Double incision mastectomy	48 (78.7%)	6 seromas, 2 partial NAC necrosis
Periareolar/keyhole	13 (21.3%)	2 dog-ear corrections

Revision rate: **11.5%**

2.4 Genital Reconstruction

- **Phalloplasty:**
- 21 patients (34.4%)
- Radial forearm free flap – 11
- Anterolateral thigh flap – 10
- **Metoidioplasty:** 9 patients (14.8%)
- **No bottom surgery:** 31 patients (50.8%)

Complications in phalloplasty:

Complication	n (%)
Urethral fistula	5 (23.8%)
Urethral stricture	4 (19.0%)
Donor-site morbidity	3 (14.3%)
Need for secondary procedure	8 (38.1%)

3. Psychological Outcomes

Significant improvements were observed in both groups at 12 months post-operation.

3.1 PHQ-9 (Depression)

- Group A: improvement from **14.2 ± 4.6 → 6.8 ± 3.1** ($p < 0.001$)
- Group B: improvement from **13.9 ± 4.4 → 8.4 ± 3.8** ($p < 0.001$)

Group A showed significantly greater reduction in depressive symptoms ($p = 0.04$).

3.2 GAD-7 (Anxiety)

- Group A: 12.6 ± 4.3 → 5.2 ± 2.6
- Group B: 12.9 ± 4.2 → 6.8 ± 3.0

Greater anxiety reduction in Group A ($p = 0.03$).

3.3 Gender Congruence and Life Satisfaction (GCLS)

- Group A: improvement of **+32.8 points**
- Group B: improvement of **+21.4 points**

Difference was statistically significant ($p = 0.02$).

4. Sexual Function Outcomes

Sexual functioning improved in both groups, but patients undergoing phalloplasty demonstrated the highest gains.

Brief Sexual Function Inventory (BSFI) – Total Score

- Phalloplasty subgroup: **+48% improvement**
- Metoidioplasty subgroup: **+33% improvement**
- No bottom surgery: **+12% improvement**

Penetrative sexual function was achieved in:

- **13/21 (61.9%)** of phalloplasty patients
- **1/9 (11.1%)** of metoidioplasty patients
- **0%** of those without genital reconstruction

Relationship/Marital Adjustment

Among partnered individuals (n=31):

- **Group A:** 78.9% reported improved relational intimacy
- **Group B:** 55.6% reported improvement
- 12.9% across the cohort reported relational strain, primarily during early postoperative recovery

5. Endocrine and Metabolic Outcomes

Testosterone therapy was continued in all patients.

Laboratory changes at 12 months

Parameter	Baseline	12 months	p-value
Hematocrit (%)	42.1 ± 2.8	48.3 ± 3.4	<0.001
LDL cholesterol (mg/dL)	108.6 ± 22.3	129.4 ± 25.1	0.01
HDL cholesterol (mg/dL)	47.5 ± 7.8	41.2 ± 6.4	0.02
ALT (IU/L)	28.4 ± 11.6	36.2 ± 13.7	0.04

Notable complications

- **Polycythaemia (>54% hematocrit):** 7/61 (11.5%)
- **Dyslipidaemia:** 19/61 (31.1%)
- **Mild hepatic enzyme elevation:** 11/61 (18%)
- **Hypertension onset:** 4/61 (6.6%)

No major cardiovascular events were reported.

Ovary-preserving patients had fewer hormone-withdrawal symptoms ($p = 0.03$).

6. Overall Comparative Evaluation (Group A vs Group B)

Outcome	Group A	Group B	p-value
Major surgical complication rate	21.8%	10.3%	0.04
Psychological improvement (GCLS gain)	+32.8	+21.4	0.02
Sexual satisfaction (BSFI gain)	+44%	+19%	0.01
Relationship improvement	78.9%	55.6%	0.04
Endocrine adverse events	28.1%	24.1%	0.68

Group A showed **higher psychological and sexual benefits** despite **higher surgical morbidity**.

Key Findings Summary

1. **Laparoscopic hysterectomy** had superior perioperative outcomes.
2. **Phalloplasty** significantly enhanced sexual satisfaction and gender congruence.
3. **Ovarian preservation** reduced symptoms during testosterone interruptions but increased dysphoria in some.
4. **Testosterone therapy** produced expected metabolic changes without major cardiometabolic events.
5. **Combined surgical pathway (Group A)** offered greater psychological and sexual benefits, though with more postoperative complications.

DISCUSSION

The present study provides one of the most comprehensive Indian datasets examining comparative outcomes across two distinct surgical pathways in female-to-male (FTM) gender affirmation, incorporating surgical, psychological, sexual, relational, and endocrine dimensions. With 61 transmasculine individuals analysed over a multi-year period, this cohort offers valuable insights into decision-making patterns, technical variations in hysterectomy and genital reconstruction, and the longitudinal effects of testosterone therapy. Notably, the comparison of a combined, structured surgical pathway (Group A) with a selective or step-wise pathway (Group B) highlights how treatment sequencing and surgical comprehensiveness shape outcomes across multiple domains.

1. Surgical Outcomes in Context of Global Evidence:

The predominance of laparoscopic hysterectomy (LH) in our cohort aligns with international trends favouring minimally invasive approaches for transgender hysterectomy. Jeftovic et al. (2018) demonstrated that LH in FTM patients is associated with shorter operative time, reduced blood loss, and lower morbidity compared to vaginal routes (21). Similarly, systematic reviews by Dominoni et al. (2024) reaffirm the superiority of laparoscopic and robot-assisted methods over conventional vaginal hysterectomy in terms of safety and recovery (20). Our findings—significantly lower blood loss, shorter hospitalization, and fewer perioperative complications with LH—are therefore consistent with established surgical evidence. The relatively small number of robot-assisted hysterectomies in our series reflects the broader Indian context, where high costs and limited availability restrict widespread use. Nevertheless, studies such as Groenman et al. (2017) have shown robot-assisted hysterectomy with colpectomy to be feasible and associated with favourable outcomes in transgender men (22). As robotic platforms expand across tertiary systems in India, further research may clarify cost-effectiveness and functional outcomes in local settings.

Phalloplasty remains technically demanding, with internationally documented rates of urethral fistula ranging from 20–40% and urethral stricture from 15–35% (10,23,30). Our complication profile—fistula in 23.8% and stricture in 19%—falls within these established ranges, demonstrating concordance with global surgical performance benchmarks. Donor-site morbidity, particularly with radial forearm free flaps (RFFF), also mirrored international statistics (10). The requirement for secondary procedures among 38.1% of phalloplasty patients is congruent with experiences reported by Satterwhite et al. and Morrison et al. (30). The low uptake of phalloplasty (34.4%) and higher inclination toward chest-only or partial surgical transition echoes patterns observed in LMIC contexts, where cost, surgeon availability, sociocultural norms, and personal preference are major determinants (2,19). Indian endocrine series, such as Majumder et al. (2016), similarly describe low phalloplasty uptake despite high chest surgery demand (19). This underscores a critical contextual nuance: transmasculine individuals in India often prioritize chest masculinisation for social passability and relief of visible dysphoria, while resource constraints may delay or prevent genital reconstruction.

2. Psychosocial Outcomes and Gender Congruence:

One of the strongest findings in this study is the substantial psychological improvement across both groups, evidenced by significant reductions in PHQ-9 and GAD-7 scores. This aligns with a robust

body of global research demonstrating that gender-affirming interventions significantly reduce depression, anxiety, and suicidality. Systematic reviews by Bauer et al. (2022), Swan et al. (2023), and Das et al. (2025) report consistent improvements in mental health markers following gender-affirming surgery (11–14). The STRONG cohort in the United States (Quinn et al., 2017) also documented substantial psychological benefit following transition-related interventions (18). Importantly, Group A experienced significantly greater psychological improvement than Group B. This likely reflects the synergistic effects of a comprehensive surgical pathway—encompassing chest, reproductive organ, and genital dysphoria relief—and the stabilising influence of structured care planning. Similar patterns were reported in the Swedish registry study by Dhejne et al. (2014) and multicentre European analyses, where more complete gender-affirming pathways corresponded with higher life satisfaction and reduced psychological morbidity. Gender Congruence and Life Satisfaction Scale (GCLS) improvements were also significantly greater in Group A. This supports WPATH SOC-8 principles emphasising that surgical access, when desired and medically appropriate, is a key determinant of congruence and well-being (1). Our findings underscore the need for comprehensive, sequentially structured care pathways in Indian settings, where piecemeal or delayed procedures may inadvertently prolong dysphoria or limit psychological benefit.

3. Sexual Function and Relational Dynamics:

Sexual functioning improved in all participants, but the magnitude of improvement clearly varied by surgical choice. Patients undergoing phalloplasty demonstrated the highest gains in BSFI scores and sexual satisfaction, with 61.9% achieving penetrative intercourse—comparable to international phalloplasty outcomes (30). These findings correspond with the review by Billings et al. (2025), which emphasised that phalloplasty enhances sexual confidence, body image, and partner intimacy beyond purely functional outcomes (14). Metoidioplasty provided more modest improvements, largely related to enhanced genital confidence rather than penetrative capacity, consistent with reports by Monstrey et al. and Hoebeke et al. (10). Individuals without genital reconstruction still experienced gains in desire and arousal, likely attributable to testosterone therapy, improved body satisfaction after top surgery, and reduction in dysphoria. However, the magnitude of improvement in this subgroup was significantly smaller. Indian data on sexual outcomes remain extremely limited. Previous local studies have focused on psychiatric and endocrine aspects rather than sexual functioning (2, 19 and32). Thus, this study adds rare insight into relational adjustment among Indian transmasculine individuals: 78.9% in Group A and 55.6% in Group B reported enhanced intimacy. These results parallel findings from van de Grift et al. (2018), who described substantial intimacy improvement post-surgery in European cohorts (7). Notably, 12.9% reported relational strain, particularly during early recovery, which aligns with international reports highlighting postoperative role adjustments, partner expectations, and temporary sexual dysfunction (18, 19). Clinically, this emphasises the need for couple-focused counselling in Indian gender-affirming programs.

4. Adnexal Management and Hormonal Considerations:

The debate between oophorectomy versus ovarian preservation remains ongoing in transgender medicine. WPATH SOC-8 does not mandate oophorectomy but recognises that dysphoria, cancer risk, fertility desires, and hormonal goals influence decision-making (1). UCSF guidelines similarly emphasise shared decision-making (24). Our findings contribute meaningfully to this debate: Patients with ovarian preservation had fewer symptoms during testosterone interruptions and lower risk of hypoandrogenism—consistent with endocrine principles that residual ovarian function offers hormonal buffering (24, 29 and 33). Conversely, these patients reported higher residual dysphoria regarding retained “female organs,” a pattern described in psychological analyses by Arif et al. (2022) (7). These nuanced findings support an individualised approach that balances psychological, endocrine, and reproductive considerations.

5. Testosterone Therapy and Metabolic Outcomes:

The endocrine profile in our cohort mirrors global evidence. Testosterone therapy predictably increased hematocrit, LDL, and LFT values—changes well documented in studies by Chan et al. (2019), Croteau et al. (2025), and the Endocrine Society (24, 31 and 34). The 11.5% polycythaemia

rate is comparable to the 8–16% rates reported internationally. Dyslipidaemia in 31.1% of patients is also within expected ranges. Importantly, no major cardiovascular events were recorded during one year of follow-up. This is consistent with the conclusion of recent systematic reviews that testosterone therapy is safe when appropriately monitored, particularly in young transmasculine adults with low baseline cardio-metabolic risk (24, 31 and 35).

6. Comparative Pathways: Clinical Implications:

The most clinically relevant contribution of this study is the comparison between Group A (comprehensive pathway) and Group B (selective pathway).

Group A demonstrated:

Greater psychological benefit

Higher sexual satisfaction

Improved relational intimacy

Greater gender congruence

Group B demonstrated:

Lower overall surgical morbidity

Fewer urethral complications

Reduced resource and cost burden

These findings reveal a central trade-off in transmasculine care:

Comprehensive pathways confer greater psychological and sexual benefit but carry higher surgical risk.

This trade-off mirrors international reports in Plastic and Reconstructive Surgery and JPRS describing genital reconstruction as the most impactful—but most complicated—component of masculinising surgery (10, 30). In the Indian context, where cost, stigma, and limited specialist availability shape care pathways, these findings emphasise the value of preoperative counselling that transparently addresses both benefits and risks.

7. Relevance to Indian Transgender Health Systems

The current Indian literature on transmasculine health is sparse and fragmented (2–5,19,27). Most centres report mixed transgender cohorts, minimal surgical disaggregation, and inadequate sexual or relational outcomes data.

The present study addresses several of these gaps by:

Providing one of the few Indian datasets focused specifically on FTM individuals

Analysing hysterectomy techniques in detail

Documenting complications and functional outcomes of phalloplasty

Integrating psychological, sexual, and relational dimensions

Offering a comparative model of comprehensive vs. selective pathways

Such evidence is essential for informing structured transgender health programs increasingly adopted in government and private settings.

8. Strengths and Limitations:

Strengths:

One of the largest Indian FTM surgical cohorts published

Multidimensional outcome assessment including validated scales

Rare comparative approach between two surgical pathways

Inclusion of sexual and relational outcomes not commonly studied in India

Limitations

Retrospective design may introduce documentation bias

Follow-up limited to 12 months; long-term outcomes require extended analysis

Self-reported sexual outcomes could be influenced by sociocultural factors

Single-centre context may limit generalisability, though uniform protocols strengthen internal validity.

9. Future Directions:
Future Indian research should include:
Larger multicentre cohorts
Cost-effectiveness evaluations of surgical pathways
Long-term (>5 years) endocrine and cardiovascular outcomes
Qualitative studies capturing lived experiences of transmasculine individuals
Partner and marital counselling frameworks tailored to Indian sociocultural context.

Conclusion: Combined staged reconstruction offers superior gender congruence, sexual outcomes, and psychological satisfaction, albeit with increased peri-operative morbidity. Surgical and endocrine decisions should be individualized, supported by integrated psychological care and culturally sensitive counselling to optimize holistic outcomes for FTM individuals in India.

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