

Nursing Education as a Strategy to Improve Oral Outcomes and Quality of Life in Patients Undergoing Buccal Mucosal Graft Urethroplasty

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Abstract

Background: Buccal mucosal graft urethroplasty is the gold standard for urethral stricture repair, but it is frequently associated with donor site complication affecting patient comfort and quality of life. Structured nursing education offers a promising strategy to mitigate these issues. **Aim:** This study aimed to evaluate the efficacy of a structured nursing education program in reducing oral donor site morbidity and improving the postoperative quality of life for patients undergoing buccal mucosal graft urethroplast. **Methods:** A quasi-experimental study was conducted at Assiut Urology and Nephrology Hospital on 60 male patients (30 control group and 30 study group). Tools included demographic and clinical data sheet, oral impact on daily performance, Rand short form -36 questionnaire and a complications checklist. **Results:** Structured nursing education significantly reduced oral complications (pain, swelling, trismus). Quality of Life was highly and significantly improved (p. value < 0.001). At six months, most study patients with early trismus improved markedly (versus only three controls). **Conclusion:** Structured nursing instruction significantly enhanced patient outcomes by reducing oral and Quality of Life-related complications, but had no effect on surgery related complications. **Recommendations:** Nursing education, including illustrated patient booklets and reinforcement of oral hygiene and jaw opening exercises, should be integrated as an essential component of perioperative care protocols for buccal mucosal graft urethroplasty patients.

keywords: Nursing education; Oral outcome; Quality of life; Buccal mucosal graft, Uethroplasty

Introduction

The urinary system plays a crucial role in maintaining internal homeostasis by eliminating metabolic waste products, regulating body fluids and electrolytes, and supporting normal renal function. Disorders affecting this system often lead to considerable morbidity, with urethral stricture being among the most

persistent and challenging conditions in urology. Urethral stricture refers to the fibrotic narrowing of the urethral lumen, which results in urinary obstruction, recurrent infections, bladder dysfunction, and if left untreated progressive renal deterioration (Barbagli et al., 2020).

Over the years, several surgical methods have been developed to manage urethral strictures, such as dilation,

internal urethrotomy, and various reconstructive urethroplasty techniques. Among these, buccal mucosal graft urethroplasty (BMGU) is currently recognized as the gold standard, especially for complex or long-segment strictures. The buccal mucosa offers optimal graft characteristics it is hairless, infection-resistant, easily harvested, and well-suited to the urethral environment thereby providing excellent integration and long-term surgical success (Horiguchi et al., 2022).

Despite these advantages, the harvesting of buccal mucosa is not without complications. Postoperative donor-site problems, including pain, bleeding, swelling, infection, and trismus (difficulty opening the jaw), can significantly impede recovery and overall comfort. Furthermore, some patients continue to experience difficulty in chewing, swallowing, and speaking for months after surgery, which can negatively influence nutrition, communication, and psychological well-being (Yilmaz et al., 2015; Farahzadi et al., 2025). Such complications extend beyond physical discomfort, often affecting social participation and overall life satisfaction (Xu et al., 2006; Kamp et al., 2005).

Nursing care is fundamental in supporting patients through the perioperative phase of BMGU. Structured nursing education has emerged as an effective approach to minimizing donor site morbidity by guiding patients in oral hygiene, dietary modification, wound care, and jaw opening exercises. These educational efforts enhance patients' understanding, strengthen self management behaviors, and promote adherence to rehabilitation routines, which collectively lead to faster recovery, reduced complications, and improved overall quality of life (QoL) (Akyüz et al., 2014; Barbagli et al., 2020).

While previous research has primarily focused on surgical outcomes and procedural innovations, limited attention has been given to the direct impact of structured nursing interventions on postoperative oral outcomes and QoL.

Significance of the study

Previous studies have explored the incidence and types of oral complications following BMGU. However, limited attention has been paid to the effectiveness of structured nursing education as a specific strategy for improving postoperative oral outcomes and quality of life. Most available research has primarily focused on surgical techniques and clinical outcomes rather than on nursing-led interventions and patient empowerment. This study, therefore, seeks to bridge this gap by assessing the direct contribution of a nursing education program in enhancing recovery, preventing complications, and improving the overall QoL among patients undergoing BMGU.

Aim

This study was to evaluate the efficacy of a structured nursing education program in reducing oral donor-site morbidity and improving the postoperative QoL for patients undergoing BMGU.

Hypothesis

This study hypothesizes that patients who receive structured nursing education (pre and post-BMGU) will experience significantly fewer oral complications, demonstrate faster functional recovery, and report better postoperative QoL compared to those receiving routine hospital care alone.

Patients and Methods

Research design

A quasi-experimental design employing two groups (a control group and an intervention/study group) was utilized to evaluate the impact of the structured nursing education program on oral outcomes and QoL among patients undergoing BMGU.

Setting

The study was conducted at the Urology and Nephrology Hospital, Assiut University, Egypt.

Sampling and sample size

The sample consisted of 60 adult male patients who underwent BMGU at Assiut University Hospital. Participants were allocated into two groups of 30 patients each:

- The control group (n=30) comprised patients who had previously undergone BMGU and received only routine hospital care.
- The study group (n=30) comprised patients who were prospectively enrolled and received structured nursing education in addition to routine care.

Eligibility and exclusion criteria:

Eligible participants were male patients aged 18 to 65 years, clinically indicated for BMGU, with no previous oral surgery, chronic oral diseases, or conditions affecting the buccal mucosa. Patients with psychiatric, cognitive, or communication disorders that could interfere with compliance, or those with systemic diseases that might delay wound healing (such as uncontrolled diabetes or severe anemia), were excluded.

Sample size calculation: The sample size was estimated using G*Power software version 3.1, based on a two-tailed t-test, with an effect size (Cohen's

d) of 0.8, an alpha level (alpha) of 0.05, and power (1-beta) of 0.80. The minimum required size was 25 patients per group. To compensate for potential dropouts, the size was increased to 30 patients in each group (Total N=60).

Tools for data collection

Six instruments were utilized, selected and/or developed by the researchers based on an extensive review of literature to ensure validity and reliability.

I: Demographic and clinical data sheet:

This form gathered sociodemographic (age, residence, education, occupation, marital status), medical/clinical (comorbidities, duration of illness, previous procedures), and operative information (graft site/length, operative time). Data for the study group were collected via direct interview, and for the control group from medical records.

II: Complication checklist (early/late, minor/major):

A structured checklist was used to record and classify complications as early (during hospitalization or first few weeks) or late (after 3 months), and as minor (transient swelling) or major (persistent trismus, severe infection). Oral morbidity was assessed clinically, with trismus measured using inter-incisal distance

III: Oral impacts on daily performance (OIDP) index:

Developed by **Adulyanon and Sheiham (1997)**, this validated tool assesses the impact of oral health on eight daily performances (e.g., eating, speaking, sleeping, work roles). Scores are obtained by multiplying frequency by severity. The total score, expressed as a percentage, reflects impairment in oral health-related QoL. The Arabic version was administered to all participants at the six-month follow-up.

IV: Rand short form 36 items questionnaire (Rand SF-36 questionnaire):

This widely used, standardized instrument, originally developed by **Ware and Sherbourne (1992)**, evaluates health-related QoL across eight domains (e.g., Physical Functioning, Bodily Pain, Mental Health). Scores (0–100) are assessed six months post-surgery, with higher scores indicating better QoL.

V: Educational booklet and structured nursing instruction protocol

This constituted the intervention, consisting of an illustrated, Arabic language booklet used to support three face-to-face educational sessions. Content covered pre/postoperative oral hygiene, wound care, catheter management, diet, hydration, and jaw opening exercises

Methods

Administrative approval:

Official administrative approval to conduct the study was obtained from the relevant administrative authorities at Assiut Urology and Nephrology University Hospital to access patient data and facility resources necessary for the implementation of the nursing education program.

Ethical Considerations

Committee, Faculty of Nursing, Assiut University. The study was reviewed and approved under item number (406) in the committee meeting held on June 26, 2022. Written informed consent was obtained from all participants after providing a full explanation of the study's purpose, nature, potential benefits, and possible risks. Confidentiality and anonymity were strictly maintained through coded data. Participants were informed of their

right to withdraw from the study at any time without any effect on the quality of their medical or nursing care.

Validity and Reliability

The content validity of all study tools and the educational booklet was thoroughly reviewed by a panel of five expert reviewers (two from urology and three from Medical-surgical nursing). Tools were evaluated for clarity, relevance, and comprehensiveness. All necessary modifications were made based on expert feedback. **Reliability testing** using Cronbach's alpha revealed an internal consistency coefficient of 0.83, indicating acceptable reliability for the instruments used.

Pilot Study

A pilot study was conducted on 10% of the total sample (six patients) to assess the feasibility, clarity, and applicability of the study tools and educational materials in a real-world setting. Since no major modifications were required, the pilot study participants were subsequently included in the final analysis.

Phases of the study

Phase I: Preparatory phase:

This phase involved the comprehensive readiness steps, including:

- The selection and development of all data collection instruments (OIDP Index, Rand SF-36, complication checklist, patient satisfaction scale).
- The development and validation of the arabic language educational booklet and the structured nursing instruction protocol by a panel of experts in urology and medical surgical nursing
- Conducting a pilot study on six patients to test feasibility and clarity. Securing ethical and administrative approvals from the relevant university and hospital authorities.

Phase II: Implementation phase

This phase involved the active recruitment of the 60 eligible patients and the delivery of the educational intervention:

Patients were recruited and allocated to either the control group (n=30), which received only routine hospital care, or the study group (n=30), which received the structured education.

The structured nursing education program was delivered to the study group in three individualized, face-to-face sessions by the researcher, utilizing the "teach-back" method to ensure comprehension, and reinforced by an illustrated Arabic-language booklet. Each session lasted approximately 40–50 minutes.:

Session I (Preoperative orientation):

Timing: Conducted during the pre-admission period, approximately one to two days before surgery.

Primary Goal: To psychologically prepare patients, strengthen their awareness of their active role in recovery, and reduce anxiety associated with the lack of information.

Content:

A simplified explanation of BMGU, including its purpose, surgical steps, and expected donor-site outcomes.

Detailed discussion of common postoperative oral complications (e.g., pain, swelling, trismus, and difficulties with chewing and speech) to enhance understanding and readiness.

Emphasis on the importance of maintaining oral hygiene, following dietary modifications, and performing jaw-opening exercises as essential preventative measures.

Provision of an illustrated Arabic-language educational booklet to support comprehension and serve as a reference.

Outcome: Patients were encouraged to take an active role in their care, fostering engagement and a sense of control over their recovery process.

Session II (Oral care and exercise training)

Timing: Delivered on the evening before surgery and reinforced within the first 24 hours postoperatively.

Primary goal: To facilitate skill acquisition and adherence by training patients in essential oral care and jaw-exercise techniques to prevent complications and promote faster functional recovery.

Content:

Step-by-step demonstrations of proper oral hygiene practices, including gentle mouth rinsing with saline solution, maintaining adequate hydration, and avoiding hard, spicy, or acidic foods.

Guidance through jaw-opening exercises, involving gradual mouth opening using finger-assisted stretching or sterile tongue depressors.

Patients practiced the exercises until they demonstrated correct technique and confidence.

Instruction to perform the exercises three times daily for six months, with emphasis on consistency and self-discipline to prevent persistent trismus.

Outcome: Patients were able to demonstrate the learned skills and expressed understanding of the significance of maintaining daily practice at home

Session III (Discharge and home care)

Timing: Conducted immediately prior to hospital discharge and subsequently reinforced during scheduled outpatient follow-up visits.

Primary goal: To promote patient independence, continuity of self-care, and long-term adherence to the prescribed recovery plan.

Content:

Education on essential home-care practices, including proper wound care, catheter management, hydration, and maintaining a soft, non-irritating diet.

Reinforcement of the importance of continuing jaw-opening exercises and oral hygiene routines at home (three times daily for at least six months).

Discussion of warning signs that require immediate medical attention (e.g., persistent bleeding, severe pain, or infection) and clear guidance on contacting healthcare providers.

Reminder of scheduled follow-up appointments and strict adherence to postoperative recommendations.

Outcome: The session concluded with an open discussion to address remaining questions and reinforce confidence in managing recovery independently

Phase III: Evaluation Phase:

This phase focused on the assessment of outcomes at two defined time points to test the study hypothesis:

1. Immediate evaluation (At discharge): The incidence and severity of early complications (e.g., pain, swelling), patient satisfaction with nursing care, and the length of hospital stay were recorded and compared between the two groups.

2. Long-term follow-up (Six months post-surgery): The OIDP index and the Rand SF-36 questionnaire were administered to assess long-term oral health-Related QoL and general health-related QoL, respectively. Late complications, including the persistence of trismus, were also assessed.

Statistical Analysis

Data were collected, coded, revised, and analyzed using the statistical package for social sciences (IBM SPSS) software, version 22. Descriptive statistics were applied to summarize the data, using frequencies and percentages for categorical variables and means with standard deviations (Mean $\pm$ SD) for continuous variables. Comparative analyses between the two groups were performed using the Chi-square (χ^2) test for qualitative variables and the Independent Samples t-test for

quantitative variables. The Pearson correlation coefficient was employed to assess the relationship between continuous variables. A confidence interval of 95% and a margin of error of 5% were adopted, setting the level of statistical significance at $p < 0.05$.

Results

Table (1): Baseline data analysis was conducted on the 60 participants (30 in the control group and 30 in the study group) to assess the comparability of the two groups prior to the intervention. Comparison of key socio-demographic and clinical variables (e.g., age, education level, duration of illness, and presence of co-morbidities) revealed no statistically significant differences between the study and control groups (p value > 0.05). This result confirms the initial homogeneity of the two groups, providing strong assurance that any observed variations in the outcome measures can be reliably attributed to the impact of the structured

Table (2): The comparison of postoperative outcomes demonstrated the sustained clinical effectiveness of the intervention across the recovery period. The immediate postoperative evaluation (at discharge) showed that the rate of early complications (such as pain and swelling) in the study group (32.3%) was significantly lower compared to the control group (67.7%) (p value < 0.005). This clearly indicated that the structured training and guidance were immediately effective in mitigating acute symptoms. Confirming this efficacy over time, the long-term follow up at six months revealed that the incidence rate of late complications, particularly trismus (restricted mouth opening), was markedly lower in the study group (16.7%) than in the control group (83.3%). Chi-square tests established a

strong statistical significance (p value < 0.01), suggesting that consistent adherence to the structured oral exercise regimen prevented the development of significant chronic functional morbidity associated with the buccal graft donor site.

Table (3): The analysis of the OIDP index scores at the six month follow-up revealed that the structured nursing education significantly reduced the negative impact of oral conditions on patients' daily lives. As shown in the table, the mean scores for the study group were consistently lower across all eight domains when compared to the control group. Statistically significant differences were found in six out of the eight domains (p value ≤ 0.001). Specifically, patients in the study group reported significantly lower impact on their ability to eat and enjoy food (3.16 ± 4.80 vs. 9.83 ± 6.66), speak and pronounce clearly (2.10 ± 3.22 vs. 6.23 ± 4.99), and carry out major work or social roles (1.90 ± 2.29 vs. 5.2 ± 4.188). furthermore, the impact on cleaning teeth, smiling/laughing, and working were all significantly lower in the intervention group (p value ≤ 0.001). no statistically significant difference was detected for the domains of sleeping and relaxing (p value = 0.207) and enjoying contact with people (p value = 0.061). these results confirm that the structured intervention was highly effective in mitigating the functional consequences of oral morbidity.

Figure (1): The structured nursing education program resulted in significantly better OIDP levels for the study group (p value = 0.01). As clearly shown in figure (1), the intervention successfully shifted patient outcomes towards minimal morbidity. Specifically, 93.3% of the study group reported either no oral impact (10.0%) or only a mild impact (83.3%). This outcome contrasts sharply with the control group, where a combined 33.3% (30.0% moderate + 3.3% severe) of patients continued to experience moderate to severe oral impacts on their daily performance, highlighting the high efficacy of the nursing instruction in mitigating the functional burden of complications.

Table (4): Across all eight domains of the Rand SF-36 questionnaire compared with controls ($p < 0.001$). This result reflects not only improved oral-related QoL but also better general physical, emotional, and social well-being. The largest statistical improvements were observed in the key domains of bodily pain, vitality, and physical functioning, confirming that the structured nursing instruction had a broad and statistically significant positive impact on the patient's holistic health status.

Table (5): Negative, and highly statistically significant correlation between the total scores of the Rand SF-36 questionnaire and the OIDP scores ($r = -0.766$, $p < 0.001$). This negative relationship indicates that as the patients' scores on the OIDP index decreased (signifying lower oral impacts), their overall health-related QoL (as measured by the Rand SF-36 scores) increased.

Table (1): Comparison of socio-demographic and clinical characteristics between the study and control groups (N=60):

Socio-demographic and clinical characteristics	Study group(n=30)		Control group (n=30)		p-value
	No.	(%)	No.	(%)	
Age (Mean ± SD)	43.87 ± 8.768		43.07 ± 8.166		.775
Residency					
• Urban	6	20	5	16.7	.836
• Rural	24	80	25	83.3	
Education					
• Illiterate	15	50	14	46.7	.892
• Basic education	6	20	8	26.7	
• Secondary	7	23.3	7	23.3	
• University	2	6.6	1	3.3	
Working status					
• Office worker	6	20	2	6.6	.301
• Manual worker	18	60	22	73.4	
• Not working	6	20	6	20	
Marital status					
• Single	4	13.3	3	10	.763
• Married	23	76.7	26	86.7	
• Widow	3	10	1	3.3	
Etiology of urethral stricture					
• Idiopathic	2	6.6	2	6.6	1.000
• Trauma	11	36.7	11	36.7	
• Inflammation	17	56.7	17	56.7	
Length of urethral stricture					
• 3 cm	9	30	10	33.3	.440
• 4 cm	15	50	17	56.7	
• 5 cm	6	20	3	10	
Location of urethral stricture					
• Bulbar	21	70	19	63.4	.841
• Penile	6	20	9	30	
• Pan urethral	3	10	2	6.6	
Duration of illness (Mean ± SD)	40.10 ± 29.552		34.47 ± 25.636		.434
Smoking					
• Yes	19	63.4	13	43.3	.195
• No	11	36.6	17	56.7	
Hypertension					
• Yes	8	26.7	4	13.3	.333
• No	22	73.3	26	86.7	
Diabetes mellitus					
• Yes	14	46.7	12	40	.795
• No	16	53.3	18	60	

Chi-square test and independent samples T-test

Non statistical significance difference $p > 0.05$

Table (2): Frequency and severity of oral and urethral complications at discharge and six-month follow-up (N=60)

Complications	Study group (n=30)		Control group (n=30)		p-value
	No	%	No	%	
Occurrence of early complications (48)	21	43.7	27	56.3	.032*
Minor early complications (47)	20	42.6	27	57.4	.029*
• Penile swelling (23)	13	56.5	10	43.5	.596
• Failure to void (7)	3	42.9	4	57.1	.500
• Urgency (12)	4	33.3	8	66.7	.333
• Mid scrotal tenderness (13)	2	15.4	11	84.6	.005**
• Scrotal swelling (13)	5	38.5	8	61.5	.532
• Pain or soreness (31)	10	32.3	21	67.7	.005**
• Difficulty in eating and speaking (30)	11	36.7	19	63.3	.03*
• Swelling (Localized cheek edema) (28)	11	39.3	17	60.7	.098
• Trismus (24)	12	50	12	50	.604
Occurrence of late complications (31)	6	19.4	25	80.6	.000**
Minor late complications (32)	6	18.7	26	81.3	.000**
• Penile pain (22)	4	18.2	18	81.8	.000**
• Post void leak (8)	3	37.5	5	62.5	.353
• Irritative LUTS (5)	0	0	5	100	.026*
• Wound discomfort (12)	1	8.3	11	91.7	.001**
• Mouth pain and numbness (15)	4	26.7	11	73.3	.036*
• Persistent trismus (12)	2	16.7	10	83.3	.011*
• Difficulty in mouth opening (13)	3	23.1	10	76.9	.029*
• Salivary changes (3)	-	-	3	100	.119
Late major complications (9)	3	33.3	6	66.7	.236
• Erectile dysfunction (6)	2	33.3	4	66.7	.335
• Chordee (6)	2	33.3	4	66.7	.335
Length of hospital stay	5.00 ± 0.871		6.07 ± 1.172		.000**

Chi-square test and independent samples T-test

Non statistical significance difference p

** Statistical Significance difference p < 0.01

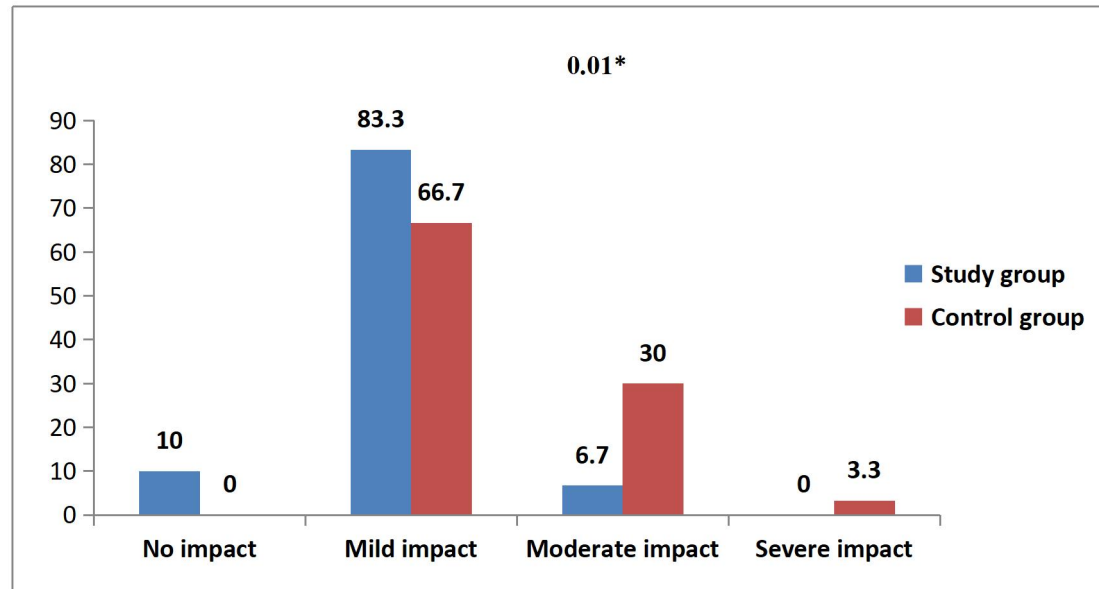
* Statistical significance difference p < 0.05

*** Highly significance difference p < 0.001

Table 3: Comparison of OIDP scores between the study and control group (N=60):

Independent samples T-test test

Non statistical significance difference p

* Statistical significance difference $p < 0.05$ ** Statistical Significance difference $p < 0.01$ *** Highly significance difference $p < 0.001$ **Figure(1): Comparison of OIDP mean scores between the study and control groups (N=60):**

Oral health-related quality of life	Study (n=30)	Control (n=30)	p-value
	Mean $\pm$ Sd	Mean $\pm$ Sd	
Eating and enjoying food	3.16 $\pm$ 4.80	9.83 $\pm$ 6.66	.001**
Speaking and pronouncing clearly	2.10 $\pm$ 3.22	6.23 $\pm$ 4.99	.001**
Cleaning teeth	1.63 $\pm$ 1.79	5.1 $\pm$ 3.679	.001**
Sleeping and relaxing	1.66 $\pm$ 1.844	2.36 $\pm$ 2.37	.207
Carrying out major work or social roles	1.90 $\pm$ 2.29	5.2 $\pm$ 4.188	.001**
Enjoying contact with people	1.66 $\pm$ 1.84	3.26 $\pm$ 4.15	.061
Smiling; laughing and showing teeth without embarrassment	.766 $\pm$ 1.50	3.5 $\pm$ 2.66	.001**
Working	1.06 $\pm$ 2.016	4.46 $\pm$ 3.65	.001**

Table (4): Comparison of mean and standard deviation of Rand SF-36 questionnaire domains between the studied groups (N=60):

Rand SF-36 questionnaire domains	Domains	Study group (n=30)	Control group (n=30)	p-value
		Mean $\pm$ Sd	Mean $\pm$ Sd	
Rand SF-36	Physical functioning	77.83 $\pm$ 20.158	50.33 $\pm$ 21.61	.000**
	Role limitations due to physical problems	69.50 $\pm$ 18.632	49.83 $\pm$ 18.170	.000**
	Role limitations due to emotional problems	63.30 $\pm$ 22.083	41.07 $\pm$ 14.356	.000**
	Vitality	77.33 $\pm$ 20.457	48.50 $\pm$ 20.433	.000**
	Mental health	79.07 $\pm$ 19.502	51.20 $\pm$ 18.949	.000**
	Social functioning	73.38 $\pm$ 16.940	51.07 $\pm$ 18.309	.000**
	Pain	85.02 $\pm$ 23.123	51.87 $\pm$ 23.712	.000**
	General health	74.53 $\pm$ 16.889	56.37 $\pm$ 13.892	.000**
Total		599.96 $\pm$ 145.66	400.24 $\pm$ 138.7	.000**

Independent samples T-test test

Non statistical significance difference p

** Statistical Significance difference p < 0.01

* Statistical significance difference p < 0.05

***Highly significance difference p < 0.001

Table (5): Correlation between OIDP scores and overall QoL (Rand SF-36 Scores)

Correlation	Rand SF-36 questionnaire	p-value
	R	
OIDP scale	-.766	.000

**Correlation is significant at the 0.01 level (2-tailed).

Discussion

Urethral stricture disease remains one of the most common and challenging conditions encountered in urological practice, frequently leading to significant urinary dysfunction and reduced quality of life. Among various surgical options, BMGU has emerged as the gold standard technique due to the excellent histological characteristics of the buccal mucosa, ensuring high graft take rates, long-term durability, and favorable surgical outcomes (Barbagli et al., 2020; Horiguchi et al., 2022; Kulkarni et al., 2023).

However, despite its surgical effectiveness, BMGU is frequently associated with donor site morbidity, including pain, swelling, trismus, chewing and speech difficulties, which may persist and negatively affect patients'

postoperative recovery and overall well-being (Yilmaz et al., 2015; Farahzadi et al., 2025; Lumen et al., 2020). These persistent complications highlight the need for comprehensive multidisciplinary postoperative care, where nursing plays an essential role in guiding patients to maintain oral hygiene, perform jaw-opening exercises, and adopt appropriate self-care strategies (Zhou et al., 2024; Husmann, 2022).

Accordingly, this study was conducted to evaluate the impact of a structured nursing education program on improving oral outcomes and overall QoL among patients undergoing BMGU, with the goal of minimizing morbidity and empowering patients to take an active role in their functional recovery.

The initial analysis of the sociodemographic and clinical

characteristics confirmed that both study groups were comparable, ensuring that any differences in postoperative outcomes could be confidently attributed to the structured nursing education rather than to demographic variations. The demographic profile reflecting patients predominantly from rural areas with limited formal education underscored a critical factor. This reality highlights the importance of the structured nursing intervention utilizing a clear, illustrated Arabic-language educational booklet, which was instrumental in bridging the literacy and cultural gap. This approach aligns with **Dublin and Stewart (2004)**, who demonstrated that simplified, culturally relevant materials significantly improve patient compliance and recovery. Furthermore, the inclusion of smoking cessation counseling addressed a common habit in this population, contributing to improved healing by mitigating smoking's known detrimental vascular effects on tissue recovery.

The central findings of the present study emphatically revealed that structured nursing education had a statistically significant positive impact on both oral outcomes and QoL. Patients who received the structured educational sessions demonstrated faster recovery from early oral complications and accelerated healing compared with those receiving routine care. This accelerated recovery translated into markedly better postoperative OIDP and Rand SF-36 scores at six months, reflecting significant improvement in both functional and psychosocial well-being. This positive effect is mechanistically attributed to the continuous, skill based approach of the intervention: the initial psychological preparation mitigated anxiety, while the focused training in session II ensured patient competency and consistent adherence to jaw opening exercises, which is the primary

mechanism distinguishing the better long-term outcomes.

Trismus emerged as the most notable long-term complication, and while it appeared early in both groups, patients in the study group showed marked improvement after consistent adherence to the exercises, whereas many in the control group experienced continued restriction. This finding highlights the critical role of continuous nursing education and patient engagement in preventing chronic functional limitation. This result is particularly significant as it suggests that guided nursing intervention can significantly shorten the recovery period and prevent the persistence of oral dysfunction, moving beyond the general observation that complications may resolve spontaneously (**Barbagli et al., 2020**). The significant improvement in outcomes validates **Horiguchi et al. (2022)** and **Kabon and Pilatz (2024)**, who emphasized that effective donor-site management improves postoperative comfort, positioning structured nursing education as an essential management approach.

Beyond the physical benefits, the present study also revealed a clear and comprehensive improvement in QoL. This enhancement was evident across all domains of the Rand SF-36 questionnaire, particularly in physical functioning, bodily pain, and mental health. This improvement is attributed to the dual effect of the nursing program: the successful reduction in oral morbidity reduced the functional burden, and the empowering educational process enhanced patient coping skills, psychological adaptation, and sense of control. This result aligns with **Akyüz et al. (2014)**, who highlighted that psychosocial support is critical for enhancing emotional stability and overall life satisfaction.

In contrast, surgical complications, such as erectile dysfunction and urinary retention, showed no significant difference between the groups. This outcome is expected and aligns with prior literature (**Kamp et al., 2005**), confirming that these variables are primarily influenced by surgical technique rather than postoperative nursing care. However, the finding of significantly higher patient satisfaction scores in the study group reinforces that the structured education complements surgical success by enhancing the overall quality of recovery and patient experience.

Critically, this result is not merely a quantitative difference; rather, it signifies a crucial qualitative shift in patient experience, where the majority of the study group successfully navigated their post-operative phase from severe to manageable oral morbidity. This success translates directly to a tangible functional improvement that was often overlooked in previous studies, which primarily focused only on incidence rates. This qualitative improvement in OIDP thus serves as the core mediator, or mechanism, driving the significant postoperative elevation in the Rand SF-36 scores. The resolution of debilitating oral symptoms thus acted as the essential pathway to enhancing the patients' overall physical and psychological QoL.

Limitations of the study

The findings of this study should be interpreted with caution due to several methodological limitations.

Primarily, the study employed a quasi-experimental design that lacked full randomization of participants. This issue is compounded by the fact that the control group was recruited retrospectively, while the study group was enrolled prospectively, thereby

introducing a potential for selection bias that limits the certainty in attributing the observed improvements exclusively to the nursing education program.

Furthermore, the study's generalizability is restricted due to its execution at a single academic center on a relatively small sample of only adult male patients undergoing a specific surgical procedure BMGU, which prevents the direct application of these results to broader populations or varied clinical settings. It should also be noted that the nursing intervention was not designed to impact the technical outcomes of the surgery itself, thus its lack of effect on surgery-related complications, such as stricture recurrence, is a limitation on the scope of the program, not its efficacy.

The research also faced a risk of subjective bias, as key outcomes were measured using patient self-report instruments (OIDP and SF-36), introducing the possibility of response bias or social desirability bias. Moreover, the intensive, individualized nature of the educational intervention may have triggered the Hawthorne effect, where observed improvements resulted partly from the focused attention received by the study group.

Finally, the six-month follow-up period may be insufficient to fully evaluate the long-term sustainability of the educational benefits, particularly regarding the prevention of chronic or late-onset complications like persistent trismus. Future studies with randomized designs, larger and more diverse samples, and longer follow-up periods are recommended to validate and extend these findings.

Conclusions

The present study unequivocally demonstrated that structured nursing education significantly enhances postoperative oral outcomes and overall QoL among patients undergoing BMGU. Patients who participated in individualized educational sessions, supported by an illustrated arabic language booklet, showed faster resolution of oral complications such as pain, swelling, and trismus along with improved functional recovery and significantly higher satisfaction compared with those who received routine care alone.

These findings underscore the crucial role of continuous patient education, consistent reinforcement of oral hygiene practices, and adherence to jaw opening exercises in effectively reducing donor site morbidity and promoting both physical and psychosocial well being. Conversely, complications directly related to surgical technique, such as erectile dysfunction or graft related failure, remained unaffected by nursing intervention, indicating that these critical outcomes are predominantly determined by intraoperative factors.

In conclusion, structured nursing education must be regarded as an integral and essential component of perioperative care for all patients undergoing BMGU. By empowering patients to actively engage in their own recovery, nursing instruction contributes directly to accelerated healing, minimized complication rates, and enhanced overall quality of life.

Recommendations

Based on the compelling findings of the present study, the following

recommendations are proposed to ensure sustainable improvement in patient care:

Structured pre- and post-operative nursing education should be formally incorporated as a standard component of care for all patients undergoing buccal mucosal graft urethroplasty. Nurses must emphasize the importance of regular jaw opening exercises and establish a structured follow-up plan to monitor oral recovery, reinforce adherence, and prevent long-term complications such as chronic trismus. Furthermore, illustrated, culturally-adapted booklets and audiovisual aids must be developed to improve patient comprehension and adherence to postoperative instructions, specifically addressing the needs of individuals with limited literacy.

On the professional development front, nursing staff must receive specialized training in perioperative counseling, oral care management, and rehabilitation techniques specifically related to mucosal graft procedures. There is also a necessity to strengthen multidisciplinary collaboration among surgeons, nurses, and allied health professionals (such as nutritionists and physiotherapists) to ensure the holistic management of postoperative recovery and sustained long-term quality-of-life improvement.

Finally, further multicenter and longitudinal studies are strongly recommended to evaluate the sustained long-term effectiveness of structured nursing education programs and to validate these findings in more diverse patient populations and clinical settings.

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