

Outcome of Fertility-Sparing Surgery in Young Cervical Surgery Patients

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ABSTRACT

Background: Fertility-sparing surgery has emerged as an important treatment option for young women with early-stage cervical cancer who desire future childbearing. Aim of the study: To evaluate oncological safety, reproductive outcomes, and postoperative complications following fertility-sparing surgery in young cervical cancer patients. **Methods & Methods:** This observational study was conducted over 2 years in a tertiary hospital in Bangladesh, including 15 patients aged ≤ 40 years with FIGO stage IA1–IB1 cervical cancer. Patients underwent radical trachelectomy, simple trachelectomy, or conization based on clinical indications. Data on socio-demographic, clinical, surgical, oncological, and fertility outcomes were collected and analyzed using SPSS version 26. Descriptive statistics were applied, and outcomes were assessed over a mean follow-up of 24 ± 3 months. **Result:** The mean age was 28.6 ± 4.1 years, with most patients in stage IB1 (46.67%). Radical trachelectomy was the most common procedure (66.67%). Mean operative time was 145 ± 28 minutes and blood loss 180 ± 60 ml. Postoperative complications occurred in 26.67% of patients. Disease-free survival was 93.33%, with a recurrence rate of 6.67%. Among 10 patients attempting conception, 60.00% achieved pregnancy, resulting in 40.00% live births, 10.00% miscarriage, and 20.00% preterm delivery. **Conclusion:** Fertility-sparing surgery is a safe and effective option in selected early-stage cervical cancer patients, offering favorable oncological control and promising reproductive outcomes.

Keywords: Fertility-sparing surgery, cervical cancer, radical trachelectomy, reproductive outcome, oncological safety, Bangladesh.

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INTRODUCTION

Fertility-sparing surgery (FSS) in cervical cancer refers to a group of conservative surgical procedures, such as radical trachelectomy, conization, or pelvic lymph node assessment, that aim to remove early-stage cervical malignancy while preserving the uterus, thereby maintaining reproductive potential in young women [1]. Cervical cancer is a malignant disease of the cervix mainly caused by persistent human papillomavirus infection, and it remains one of the most common cancers affecting women globally [2]. Globally, cervical cancer is the fourth most common cancer among women, with approximately 604,000 new cases and a significant burden in reproductive-age women, especially those aged 30-34 years [3]. In Bangladesh, cervical cancer approximately 9,600-12,000 new cases occur annually, with about 5,200-6,500 deaths each year, making it one of the leading causes of cancer-related mortality among women in the country [4]. The process of fertility-sparing surgery involves excision of the cervical tumor and adjacent high-risk tissues while preserving the uterine body to maintain reproductive potential. In radical trachelectomy, the cervix, surrounding parametrial tissue, and a small portion of the upper vagina are removed, followed by reanastomosis of the uterus to the vagina. Pelvic lymph node assessment is typically performed to confirm oncologic safety [5]. This approach ensures complete tumor clearance while preserving uterine function and maintaining the potential for future pregnancy in appropriately selected patients [6].

Fertility-sparing surgery has a significant impact by preserving reproductive potential and improving psychological well-being in young women. It reduces infertility-related distress and enhances quality of life [7]. Favorable oncological outcomes are observed with low recurrence rates and satisfactory survival following fertility-sparing surgery. Additionally, reproductive outcomes are encouraging, with substantial pregnancy rates reported among appropriately selected patients, supporting its role as a safe and effective option in early-stage disease management [8]. Fertility-sparing surgery offers key advantages, including preservation of reproductive capacity, favorable survival outcomes in early-stage disease, and improved psychological well-being [9]. However, it is associated with increased risks of obstetric complications such as preterm delivery, miscarriage, and cervical insufficiency, along with strict selection criteria limiting its applicability [10]. The importance of this study lies in addressing the growing number of young women diagnosed with cervical cancer who wish to preserve fertility, particularly in developing countries where childbearing plays a crucial social role. It helps guide clinical decision-making and improves patient-centered care [11]. Limitations in existing research include small sample sizes, heterogeneous surgical techniques, lack of long-term follow-up, and limited data from low- and middle-income countries. Most studies are retrospective and conducted in specialized centers, reducing generalizability [3]. Therefore, there is a strong need for the current study to generate region-specific evidence,

particularly in resource-limited settings like Bangladesh, where clinical outcomes and fertility results remain underreported. This will help bridge the knowledge gap in real-world practice. The study aimed to evaluate oncological safety, reproductive outcomes, and postoperative complications following fertility-sparing surgery in young cervical cancer patients.

METHODS & MATERIALS

This observational study was conducted in Department of Gynae Oncology Bangladesh Medical University, Dhaka, Bangladesh over a period of 2 years from January 2023 to December 2024, focusing on young patients diagnosed with early-stage cervical cancer who underwent fertility-sparing surgery. A total of 15 patients were included using a purposive sampling technique, forming a well-defined study population. All participants were selected based on strict eligibility criteria to ensure clinical relevance and validity of outcomes. The patients were managed according to standard oncological protocols and were selected for fertility-preserving procedures based on tumor stage, size, and desire for future fertility. Different surgical approaches, including radical trachelectomy, simple trachelectomy, and cervical conization, were performed depending on individual clinical indications. Pelvic lymphadenectomy was carried out where appropriate.

Inclusion Criteria

- Patients aged ≤ 40 years with histologically confirmed early-stage cervical cancer (FIGO stage IA1–IB1).
- Patients desiring fertility preservation.
- Tumor size ≤ 4 cm with no evidence of distant metastasis.

Exclusion Criteria

- Advanced-stage cervical cancer beyond FIGO stage IB1.
- Patients not willing to preserve fertility.

- Presence of distant metastasis or significant comorbidities contraindicating surgery.

Data Collection

Data were collected using a structured and pre-tested data collection sheet. Variables recorded included socio-demographic characteristics (age, marital status, parity, residence), clinical and tumor-related factors (FIGO stage, histopathology, tumor size, lymphovascular space invasion), surgical details (type of surgery, approach, operative time, blood loss, intraoperative complications), and postoperative outcomes (hospital stay, complications, reoperation).

Oncological outcomes such as recurrence and disease-free survival were assessed during follow-up visits over a mean duration of 24 ± 3 months. Fertility outcomes were evaluated among patients attempting conception, including successful pregnancy, live birth, miscarriage, preterm delivery, and infertility.

Statistical Analysis

All statistical analyses were performed using SPSS software (version 26). Continuous variables were expressed as mean $\pm$ standard deviation (SD), while categorical variables were presented as frequency and percentage. Descriptive statistics were primarily used to summarize the data due to the small sample size.

RESULT

Table 1 demonstrates that the highest proportion of patients belonged to the 26–30 years age group (40.00%), followed by ≤ 25 years (26.67%), 31–35 years (20.00%), and > 35 years (13.33%), with a mean age of 28.6 ± 4.1 years. Most participants were married (86.67%), while 13.33% were unmarried. Regarding parity, the majority were nulliparous (60.00%), compared to 40.00% parous. A greater proportion of patients resided in rural areas (66.67%) than in urban areas (33.33%).

Table 1: Baseline socio-demographic characteristics of patients ($n = 15$)

Baseline Characteristics	Frequency (n)	Percentage (%)
Age group (years)		
≤ 25	4	26.67
26–30	6	40.00
31–35	3	20.00
> 35	2	13.33
Mean age (years)	28.6 ± 4.1	
Marital status		
Married	13	86.67
Unmarried	2	13.33
Parity		
Nulliparous	9	60.00
Parous	6	40.00
Residence		
Urban	5	33.33
Rural	10	66.67

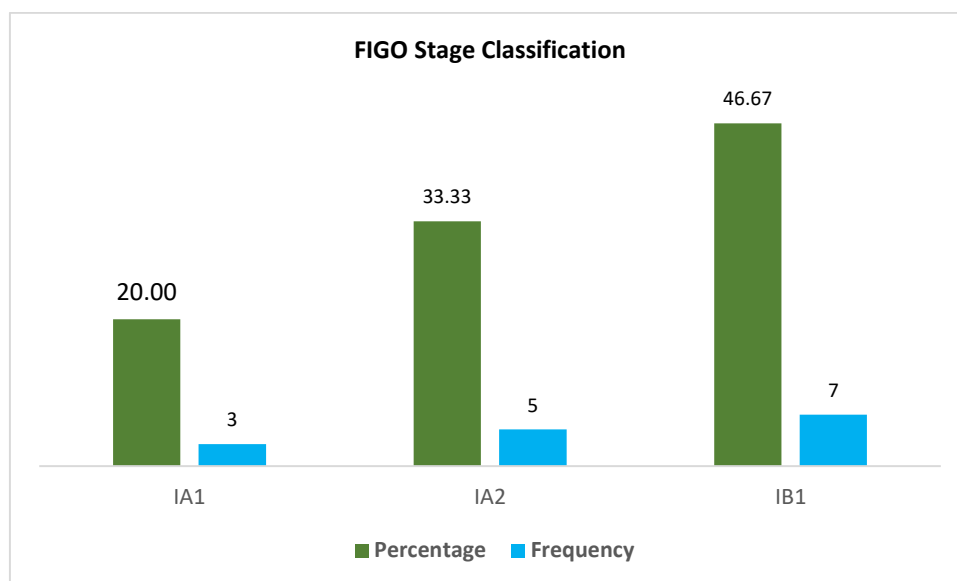


Figure 1: Clinical and tumor characteristics by FIGO Stage Classification

Figure 1 illustrates that the most common FIGO stage was IB1 (46.67%), followed by IA2 (33.33%) and IA1 (20.00%). Histopathologically, squamous cell carcinoma predominated (73.33%), while adenocarcinoma accounted for 26.67%. Most

tumors were ≤ 2 cm in size (66.67%), whereas 33.33% were > 2 cm. Lymphovascular space invasion (LVSI) was absent in the majority (80.00%) and present in 20.00% of cases (Table II).

Table II: Clinical and tumor characteristics (n = 15)

Clinical Variables	Frequency (n)	Percentage (%)
Histopathology		
Squamous cell carcinoma	11	73.33
Adenocarcinoma	4	26.67
Tumor size		
≤ 2 cm	10	66.67
> 2 cm	5	33.33
Lymphovascular space invasion (LVSI)		
Present	3	20.00
Absent	12	80.00

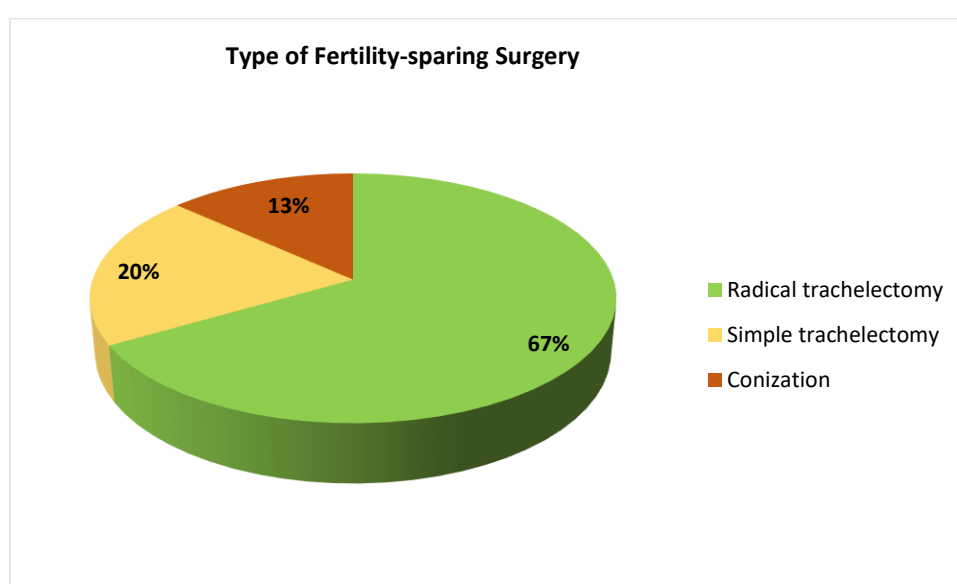


Figure 2: Type of Fertility-sparing Surgery

Radical trachelectomy was the most frequently performed procedure (66.67%), followed by simple trachelectomy (20.00%) and conization (13.33%) *Figure 2*.

The laparoscopic approach was most common (53.33%), with open (33.33%) and robotic (13.33%) approaches less frequent.

Pelvic lymphadenectomy was performed in 86.67% of patients. The mean operative time was 145 ± 28 minutes, and the mean blood loss was 180 ± 60 ml. Intraoperative complications were rare, occurring in only 6.67% of cases (*Table III*).

Table III: Surgical characteristics and intraoperative outcomes ($n = 15$)

Surgical Variables	Frequency (n)	Percentage (%)
Surgical approach		
Open	5	33.33
Laparoscopic	8	53.33
Robotic	2	13.33
Pelvic lymphadenectomy performed	13	86.67
Mean operative time (minutes)		145 ± 28
Mean blood loss (ml)		180 ± 60
Intraoperative complications	1	6.67

The mean hospital stay was 4.2 ± 1.1 days. Most patients experienced no complications (73.33%), while infection was the most common complication (13.33%), followed by

hemorrhage (6.67%) and cervical stenosis (6.67%). Reoperation was required in 6.67% of patients (*Table IV*).

Table IV: Postoperative outcomes and complications ($n = 15$)

Postoperative Outcomes	Frequency (n)	Percentage (%)
Hospital stay (days)		4.2 ± 1.1
Postoperative complications		
Hemorrhage	1	6.67
Infection	2	13.33
Cervical stenosis	1	6.67
No complications	11	73.33
Reoperation required	1	6.67

Disease-free survival was high at 93.33%, with recurrence observed in only 6.67% of patients. The recurrence was local in

nature (6.67%), with no distant metastasis reported. The mean follow-up duration was 24 ± 3 months (*Table V*).

Table V: Oncological outcomes during follow-up ($n = 15$)

Oncological Outcomes	Frequency (n)	Percentage (%)
Recurrence	1	6.67
Disease-free survival	14	93.33
Type of recurrence		
Local	1	6.67
Distant	0	0.00
Mean follow-up duration (months)		24 ± 3

Table VI presents fertility and obstetric outcomes among patients attempting conception ($N = 10$). All eligible patients attempted conception (100.00%), and successful conception occurred in 60.00% of cases. Among pregnancy outcomes, live

birth was achieved in 40.00%, preterm delivery in 20.00%, and miscarriage in 10.00%. Infertility was observed in 40.00% of patients.

Table VI: Fertility and obstetric outcomes ($n = 10^*$)

Fertility Outcomes	Frequency (n)	Percentage (%)
Attempted conception	10	100.00
Successful conception	6	60.00
Pregnancy outcomes		
Live birth	4	40.00
Miscarriage	1	10.00
Preterm delivery	2	20.00
Infertility	4	40.00

*Among patients attempting conception.

DISCUSSION

Fertility-sparing surgery is increasingly recognized as a viable treatment option for early-stage cervical cancer, achieving low recurrence rates (typically <5%) while maintaining satisfactory reproductive outcomes in appropriately selected patients [12]. The mean age was 28.6 ± 4.1 years, with the majority (40.00%) aged ≤ 30 years and predominantly nulliparous (60%). This aligns closely with findings from Nezhat, in which the median age ranged from 20-45 years (47.3%), and a large proportion of patients were nulliparous, reflecting the reproductive intent of candidates for FSS [2]. Similarly, a study by Kuznicki reported that most patients undergoing fertility-preserving procedures were in their late 20s to early 30s, emphasizing the selection of younger women for such interventions [13]. Our higher proportion of married patients (86.67%) is comparable to sociocultural trends observed in South Asian regions but contrasts slightly with Western studies, where marital distribution is more balanced [14]. Most patients in our study had early-stage disease (IA1-IB1), with IB1 being the most common (46.67%). This is consistent with international guidelines recommending FSS for tumors ≤ 2 cm in stage IA1-IB1 disease [12]. Comparable distributions were observed in a large systematic review by Nezhat, where early-stage disease predominated among FSS candidates [15]. Histologically, squamous cell carcinoma (73.33%) was the most frequent subtype, similar to global trends where squamous histology accounts for the majority of early cervical cancers. Kuznicki also reported squamous carcinoma as the dominant histology across multiple studies [13]. Tumor size ≤ 2 cm in 66.67% of cases in our study aligns with established selection criteria. Previous evidence indicates that tumors < 2 cm are associated with lower recurrence and better fertility outcomes [16]. Radical trachelectomy was the most commonly performed procedure (66.67%), followed by simple trachelectomy (20.00%) and conization (13.33%). This distribution mirrors findings from a study, where radical trachelectomy remains the standard for tumors > 2 mm invasion or stage IB1 disease [12]. Minimally invasive approaches (laparoscopic and robotic) accounted for 66.66% of surgeries in our study. This is consistent with a similar study, which demonstrated that robotic approaches are associated with reduced blood loss and shorter hospital stay compared to open surgery, without compromising oncologic outcomes [17]. Our mean operative time was 145 ± 28 minutes, which is notably similar to a systematic review comparing radical trachelectomy (RT) to radical hysterectomy (RH), which found that RT often requires significantly longer operative times, with a weighted mean difference of approximately 23 minutes more than RH [18]. Our mean blood loss (180 ± 60 ml) is comparable to that of robotic surgery studies, which have reported significantly lower blood loss (approximately 62.5 ml) compared to open procedures (approximately 300 ml) [19]. Postoperative outcomes in our study were favorable, with a mean hospital stay of 4.2 ± 1.1 days and 73.33% of patients experiencing no complications. These findings are consistent with prior studies demonstrating relatively short hospital stays, especially with minimally invasive techniques [20]. The rates of hemorrhage (6.67%), infection (13.33%), and cervical stenosis (6.67%) are comparable to those reported in systematic reviews, where cervical stenosis occurs in approximately 4-9% of cases [21]. The oncologic outcomes in our study are particularly encouraging, with a recurrence rate of 6.67% and disease-free survival (DFS) of 93.33% over a mean follow-up of 24 months. These findings are consistent with global data reporting recurrence rates between 2-5% for

early-stage disease undergoing FSS [22]. Similarly, a large-scale review of over 1,300 RT procedures reported a 3% recurrence risk, with overall survival rates exceeding 97% for early-stage disease [23]. Nezhat reported a mean recurrence rate of 3.2% and excellent survival outcomes, further supporting the oncologic safety of FSS [2]. A similar study found comparable recurrence rates across different surgical techniques, suggesting that minimally invasive approaches do not compromise oncologic outcomes [24]. Among patients attempting conception, our study demonstrated a pregnancy rate of 60.00% and a live birth rate of 40.00%. These results are comparable to the systematic review by Nezhat et al., which reported a mean pregnancy rate of 53.2% and live birth rate of 67.8% [2]. Our pregnancy rate (60.00%) and our preterm delivery rate of 20.00% is consistent with the 25.7%-73% range reported in recent literature for radical trachelectomy and significantly lower than the 46% preterm rate reported in some larger series [23]. The miscarriage rate (10.00%) and preterm delivery rate (20.00%) in our study are also consistent with existing literature. This discrepancy may be due to our inclusion of less radical procedures like conization (13.33%) and simple trachelectomy (20.00%), which are known to have better obstetric outcomes than radical abdominal trachelectomy [25]. Our miscarriage rate of 10.00% aligns closely with the 15% rate reported in a comprehensive meta-analysis of reproductive outcomes after gynecological cancer treatments [26]. Overall, fertility-sparing surgery in young women with early-stage cervical cancer demonstrates favorable oncologic safety with low recurrence and encouraging reproductive outcomes, supporting its role as a standard treatment option in appropriately selected patients [27].

LIMITATIONS

The study has several limitations, including a small sample size ($N=15$), which limits the generalizability of findings and precludes advanced statistical analysis. The short follow-up duration (24 ± 3 months) may not fully capture long-term oncological outcomes and late recurrences. Additionally, the use of purposive sampling and a single-center design may introduce selection bias. Variability in surgical techniques and limited assessment of long-term fertility outcomes further restrict the strength of conclusions drawn from this study.

CONCLUSION

Fertility-sparing surgery demonstrated favorable oncological safety and acceptable reproductive outcomes in carefully selected young patients with early-stage cervical cancer. The majority of patients remained disease-free (93.33%) over a mean follow-up of 24 ± 3 months, with a low recurrence rate (6.67%), supporting the oncologic adequacy of conservative surgical approaches. Reproductive outcomes were encouraging, with 60.00% achieving conception and 40.00% resulting in live births, although notable risks of infertility (40.00%) and preterm delivery (20.00%) were observed. Overall, fertility-sparing surgery represents a viable and effective option that balances cancer control with preservation of reproductive potential, particularly in resource-limited settings when strict selection criteria and close follow-up are maintained.

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

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