



Factors Associated with Difficult Negotiation of the Internal Os Using a 2.9 mm Hysteroscope: A Prospective Study

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Abstract

Introduction: hysteroscopy using a 2.9 mm hysteroscope is increasingly preferred due to minimal invasiveness . However, difficulty in negotiating the internal os remains a significant challenge, leading to prolonged procedure time, need of cervical dilatation . Objective of this study is to observing the factor associated with difficult negotiation of the internal cervical os during hysteroscopy using a 2.9 mm hysteroscope.

Material and methods: This prospective observational study was conducted over 24 months and included 968 women undergoing diagnostic or operative hysteroscopy with a 2.9 mm hysteroscope under general anaesthesia Factors analyzed included uterine position, menopausal status, cycle timing, parity, surgeon experience, history of prior cervical procedures, need for cervical dilatation, and average procedure time. Difficulty in negotiation of the internal os was defined as failure to pass the hysteroscope smoothly without cervical dilatation and increased procedural time.

Results: Difficult negotiation of the internal os was significantly associated with retroverted uterine position, menopausal status, nulliparity, beginner surgeon experience, and the presence of cervical stenosis ($p < 0.0001$). Cycle timing showed no significant association ($p = 0.325$) Cervical dilatation was required in 148 (15.3%) of cases out of 968 cases. Procedures performed by beginner surgeons had significantly longer average durations (18seconds by beginner, 8 seconds by experienced surgeons), particularly in difficult cases.

Conclusion: Multiple patient- and surgeon-related factors influence the ease of negotiating the internal os during hysteroscopy with a 2.9 mm scope. Recognition of associated factors allows better patient selection, counseling, and use of preventive strategies .

Keywords: hysteroscopy, internal os, cervical negotiation, 2.9 mm hysteroscope

Introduction

Hysteroscopy is the gold standard for direct visualization of the uterine cavity and has become an indispensable tool in modern gynecological practice [1]. Successful hysteroscopy requires smooth negotiation of the cervical canal and internal os, which often represents the most challenging step of the procedure [2]. Difficulty in negotiating the internal os can lead to prolonged procedure time, cervical trauma, and false passage creation [3].

The advent of miniaturized hysteroscopes, particularly 2.9 mm scopes, has facilitated shorter procedure time and a lesser need for cervical dilatation [4,]. Despite these advances, negotiation of the internal cervical os remains a critical step and can be technically challenging in a subset of patients [6]. Difficulty in negotiating the internal cervical os during hysteroscopy may result from anatomical, physiological, and procedural factors. Cervical stenosis, commonly seen in postmenopausal or

nulliparous women and after cervical surgery like LEEP, LLETZ, conization and repeated D&E etc., leads to reduced cervical compliance and increased resistance at the internal os [7,8]. An altered uterine axis, particularly in retroverted uteri, disrupts cervical-uterine alignment and increases entry difficulty [10]. Hypoestrogenic states cause cervical atrophy and further contribute to stenosis [6,7]. Additionally, surgeon experience plays a crucial role, as inexperienced operators are more likely to encounter difficulty and require cervical dilatation compared with experienced surgeons [1,5,12]. Understanding these factors is essential for optimizing hysteroscopic outcomes and minimizing patient discomfort [9].

Aims and Objectives

Primary Objective

To identify factors associated with difficult negotiation of the internal os using a 2.9 mm hysteroscope.

Secondary Objectives

To assess the need for cervical dilatation.

To evaluate the influence of surgeon experience on procedure duration.

Materials and Methods

Study Design : Prospective observational study.

Study Setting and Duration : Conducted over 2 year at shubham care hospital and nishant ivf center.

Study Population : A total of 968 women undergoing office hysteroscopy with a 2.9 mm hysteroscope were included.

Inclusion Criteria:

Age ≥ 18 years

Indications for diagnostic hysteroscopy:

Abnormal uterine bleeding

Postmenopausal bleeding

Infertility evaluation

Recurrent pregnancy loss

Both nulliparous and multiparous women

Exclusion Criteria:

Pregnancy

Acute pelvic infection

Known cervical malignancy

Severe uterine prolapse

Definition of Difficult Negotiation

Difficulty was defined as inability to negotiate the internal os smoothly requiring additional interventions such as cervical dilatation, repeated attempts or prolonged procedure time.

Statistical Analysis

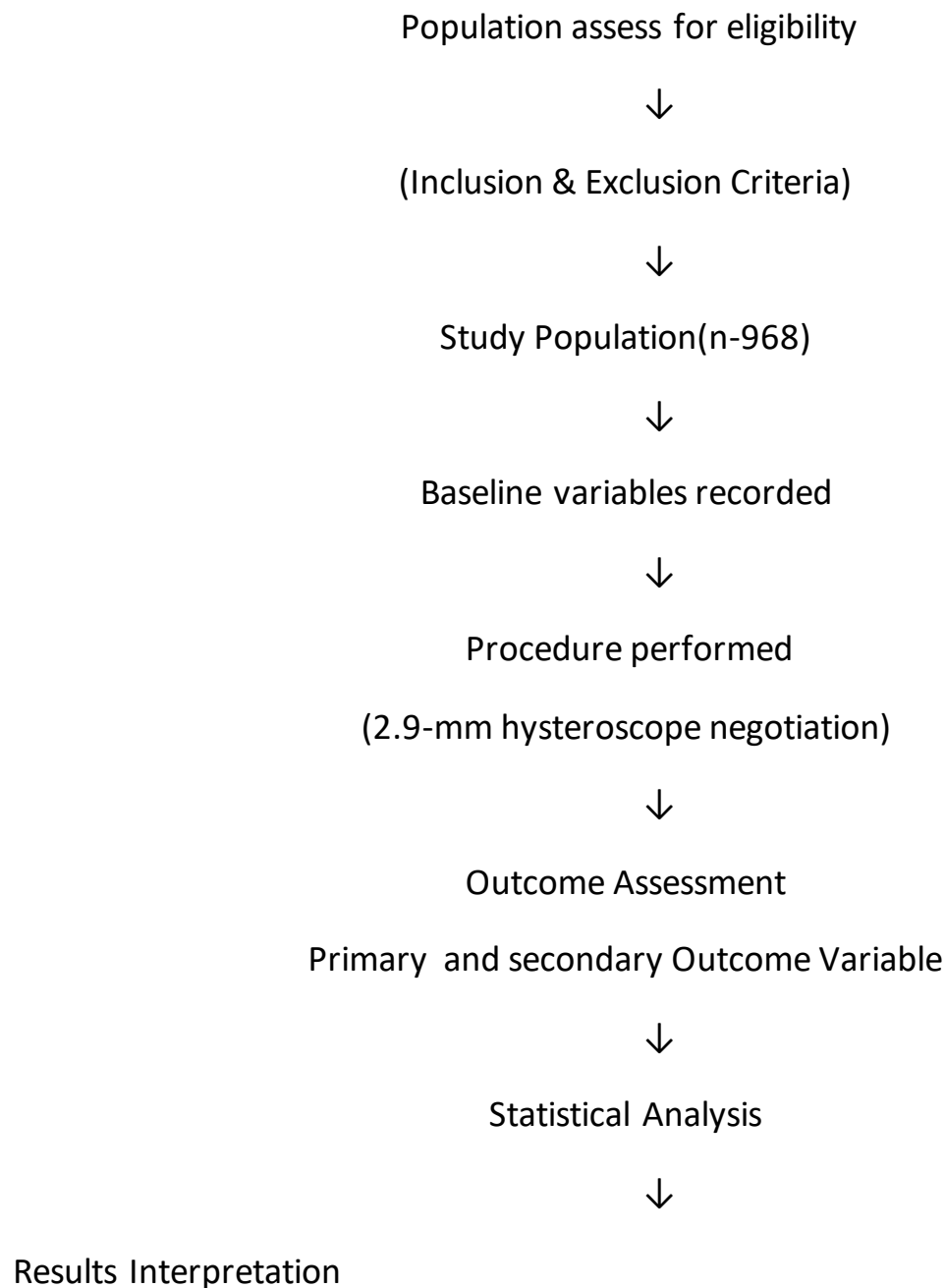
Data were analyzed using fisher's exact test . A p-value < 0.05 was considered statistically significant.

Methodology

In this study, all patients were first evaluated through detailed history taking and informed written consent was obtained. Patient history included age, body mass index (BMI), residence noted. Baseline variables like menstrual cycle timing, parity, and menopausal status, prior cervical procedure noted. A bimanual pelvic examination was performed after general anesthesia to assess the position and mobility of the cervix and uterus. Diagnostic hysteroscopy was performed. Negotiation of the internal cervical os was attempted using the vaginoscopic no touch approach without cervical dilatation . Normal saline was used as distension medium. Procedures were carried out by either beginner surgeons (less than 50 hysteroscopies performed) and experienced surgeons (more than 200 hysteroscopies performed).

During the procedure, the ease of negotiation of the internal cervical os was carefully assessed. The presence of difficulty in negotiating the internal os, as well as the requirement for cervical dilatation and average procedure time (defined as the interval between the vagina being instrumented to the time internal os was negotiated) were noted . Factors causing difficulties in negotiating internal cervical os analyzed included uterine position, menopausal status, cycle timing, parity, surgeon experience, cervical stenosis were recorded systematically for analysis.

Flow chart



Results

In this study of 968 women undergoing office hysteroscopy with a 2.9-mm hysteroscope, several patient- and operator-related factors showed a significant association with difficult negotiation of the internal os. Difficulty was significantly higher in

women with a retroverted uterus compared to an anteverted uterus (13.03% vs 2.12%, $p < 0.0001$). Menopausal women experienced markedly greater difficulty than non-menopausal women (50% vs 18.05%, $p < 0.0001$). Nulliparous women had a substantially higher rate of difficult negotiation compared to multiparous women (15.95% vs 0.01%, p

< 0.0001). Surgeon experience had a strong influence, with beginner surgeons encountering significantly more difficulties than experienced surgeons (58% vs 4.9%, $p < 0.0001$). Cervical stenosis showed a strong association with difficult negotiation of the internal os. Difficulty was observed in 69.95% of women with

cervical stenosis compared to 29.93% without stenosis, a difference that was highly significant ($p < 0.0001$). In contrast, menstrual cycle timing did not significantly affect the ease of internal os negotiation ($p = 0.3258$).

Table1. Factors associated with difficult negotiation of the internal os

Factor	Total No. N(%)	No. of Difficult Cases N(%)	P-value
Uterus Position - AV	423 (43.9%)	9 (2.12%)	<0.0001 Significant
Uterus Position - RV	545 (56.09%)	71 (13.03%)	
Menopausal Status - Menopausal	298 (30.78%)	149 (50%)	<0.0001 Significant
Menopausal Status - Non-menopausal	670 (69.21%)	121 (18.05%)	
Cycle Timing - Proliferative	680 (70.24%)	123 (18.08%)	0.3258 Non-significant
Cycle Timing - Luteal	288 (29.75%)	47 (16.32%)	
Parity - Nulliparous	702 (72.52%)	112 (15.95%)	<0.0001 Significant
Parity - Multiparous	266 (27.47%)	3 (0.011%)	
Surgeon Experience - Beginner	443 (45.76%)	257 (58%)	<0.0001

Surgeon Experience - Experienced	525 (54.23%)	26 (4.9%)	Significant
Cervical stenosis present	243 (25.10%)	170 (69.95%)	<0.0001 Significant
Cervical stenosis absent	725 (74.89%)	217 (29.93%)	

Table 2. Need of cervical dilatation

Cervical dilatation was required in 148 patients, accounting for 15.3% of cases, while the procedure was completed without dilatation in 820 patients (84.7%), indicating that the majority of procedures did not require cervical dilatation.

Table 3. Average procedure time overall and in difficult case

Need of cervical dilatation	Total No.	N (%)
Yes	148	15.3%
No	820	84.7%

Procedure duration was strongly influenced by surgeon experience. Overall, procedures performed by beginner surgeons required a substantially longer average time compared to those performed by experienced surgeons (18 seconds vs 8 seconds). This difference was even more pronounced in difficult cases, where the average procedure time increased markedly for beginner surgeons compared with experienced surgeons (28 seconds vs 16 seconds). These findings indicate that increasing surgical experience is associated with greater procedural efficiency and more effective management of technically challenging hysteroscopic cases.

Type of surgeon	Avg. Procedure Time overall(seconds)	Avg. Time in difficult cases(seconds)
Beginner	18	28
Experienced	8	16

Discussion

In this prospective study of 968 patients, difficult negotiation of the internal cervical os was significantly

influenced by both patient-related and operator-related factors. The strong association between retroverted uterine position and procedural difficulty in our study is consistent with the findings of Di Spiezio Sardo et al.2016 [10], who demonstrated that altered cervical–uterine axis alignment in retroverted uteri significantly increases resistance during hysteroscopic entry. Menopausal status and nulliparity were important predictors of difficult internal os negotiation in our cohort. These findings are in agreement with Vitale et al.2018 [6] and Bradley et al.2002 [7], who attributed increased hysteroscopic difficulty in these groups to cervical stenosis, reduced estrogen-related cervical compliance, and anatomical narrowing. Additionally, Propst et al.2000 [11] identified postmenopausal status and nulliparity as significant risk factors for cervical trauma and entry-related complications, further supporting our results.

Surgeon experience emerged as a major determinant of procedural success and efficiency in our study. Beginner surgeons encountered significantly more difficult cases and longer procedure times, particularly in patients with unfavorable cervical or uterine factors. This finding parallels the learning-curve data reported by De Silva et al. 1999[5] and Van Dongen et al.2008 [12], both of whom demonstrated that increased hysteroscopic experience is associated with improved cervical negotiation, reduced need for dilatation, and

shorter procedure duration. Propst et al. 2000[11] similarly emphasized operator inexperience as an independent predictor of hysteroscopic complications.

Cycle timing did not significantly influence internal os negotiation in our study, a finding that corroborates the results of Preutthipan and Herabutya et al.2005[13], who showed that while cycle timing affects endometrial visualization, it has minimal impact on cervical negotiability. This supports the feasibility of performing hysteroscopy based on clinical indication rather than strict cycle scheduling.

Cervical dilatation was required in only 15.3% of cases in our study, underscoring the effectiveness of miniaturized hysteroscopes and the vaginoscopic approach. This observation is consistent with the reports of Bettocchi et al.1997 [4], oppegard et al. 2008 [8] and Nappi et al.2007 [14], who demonstrated that routine cervical dilatation is unnecessary in most cases when small-diameter hysteroscopes are used.

Overall, our findings closely mirror existing literature and further reinforce that recognition of high-risk patient characteristics, combined with adequate surgical training and the use of modern hysteroscopic techniques, is essential for minimizing difficulty during internal os negotiation and optimizing hysteroscopic outcomes.

Table 4 : Comparison of Present Study Findings with Previous Studies on Factors Affecting Internal Os Negotiation

Factor	Present Study (n = 968)	Comparable Studies	Key Similar Findings
Uterine position	Retroverted uterus significantly associated with difficult negotiation	Di Spiezio Sardo et al., 2016 [10]	Altered cervical–uterine axis in retroverted uterus increases resistance during hysteroscopic entry
Menopausal status	Menopausal women had significantly higher difficulty	Vitale et al., 2018 [6]; Bradley et al., 2002 [7]	Hypoestrogenism leads to cervical rigidity and stenosis

Parity	Nulliparity strongly associated with difficulty	Bradley et al., 2002 [7]; Propst et al., 2000 [11]	Narrow cervical canal in nulliparous women increases entry difficulty and trauma
Surgeon experience	Beginner surgeons had more difficult cases and longer procedure time	De Silva et al., 1999 [5]; Van Dongen et al., 2008 [12]; Propst et al., 2000 [11]	Clear learning curve; experience improves cervical negotiation and efficiency
Cycle timing	No significant association with difficulty	Preutthipan & Herabutya, 2005 [13]	Cycle timing affects visualization but not cervical negotiability
Need for cervical dilatation	Required in only $\sim 1/3$ of cases	Bettocchi et al., 1997 [4]; Oppegaard et al., 2008 [8]; Nappi et al., 2007 [14]	Mini-hysteroscopes and vaginoscopic approach reduce need for routine dilatation

Conclusion

This prospective study demonstrates that difficult negotiation of the internal cervical os during hysteroscopy is significantly influenced by uterine retroversion, menopausal status, nulliparity, cervical stenosis, and surgeon experience, while cycle timing has no significant impact. The majority of procedures were successfully completed without cervical dilatation using a 2.9-mm hysteroscope. Increased surgical experience was associated with fewer difficult cases and shorter procedure times, particularly in challenging situations. Recognition of these factors can aid in pre-procedure planning, appropriate case allocation, and targeted training, thereby improving procedural efficiency and patient safety.

A limitation of our study is that difficulty in negotiating the internal os was assessed subjectively by the operator, which may introduce observer bias. Based on our findings, we recommend routine pre-procedural risk stratification before hysteroscopy, structured and supervised training programs for surgeons

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