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Original Research Article

A Comparative Study of Manual Vacuum Aspiration (MVA) and Electric Vacuum Aspiration (EVA) for the Surgical Management in Pregnancy Termination of Upto 10 Weeks Gestation

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Abstract

Introduction: Termination of pregnancy in the first trimester is one of the most commonly performed gynecological procedures worldwide. Both Manual Vacuum Aspiration (MVA) and Electric Vacuum Aspiration (EVA) are established methods for surgical management of early pregnancy termination. While both techniques are considered safe and effective, differences may exist in terms of efficacy, safety profile, complications, procedure time, and patient acceptability.

Objectives: To compare the outcomes of Manual Vacuum Aspiration (MVA) and Electric Vacuum Aspiration (EVA) for pregnancy termination up to 10 weeks of gestation.

Methods: This hospital-based prospective randomized comparative study was conducted over one year in the Department of Obstetrics & Gynecology at Chittaranjan Seva Sadan College. It included 200 women with first-trimester abortion (≤10 weeks) who met the Government of India MTP criteria. Patients were randomized to undergo either Manual Vacuum Aspiration (MVA) or Electric Vacuum Aspiration (EVA), and data were collected on age, gravida, gestational age, locality, and socioeconomic status, cause of abortion, bleeding, complications, pain, and post-abortal contraceptive practices to compare outcomes between the two groups.

Results: In this study of 200 patients, the MVA and EVA groups were comparable in age distribution, with the majority in the 21–30 years range (MVA: 71%, EVA: 64%; p=0.466) and similar gravida status (p=0.74), while gestational age showed a significant difference (p=0.02), with more patients at 5 weeks in the MVA group (5%) and more at 10 weeks in the EVA group (28%). Socioeconomic status also differed significantly (p=0.044), with a higher proportion of lower socioeconomic patients in the MVA group (77% vs 64%). Blood loss increased with gestational age, with MVA consistently lower than EVA (6 weeks: 23.5 ml vs 27.5 ml, p<0.001; 8 weeks: 28.46 ml vs 35.03 ml, p<0.001; 9 weeks: 33.4 ml vs 38.86 ml, p=0.01; 10 weeks: 36.29 ml vs 43.49 ml, p<0.001; 7 weeks difference not significant, 28.5 ml vs 32.3 ml, p=0.076). Hospital stay was shorter with MVA across all gestational ages (6–6.67 days) compared to EVA (13.2–15 days), with significant differences at 6, 8, 9, and 10 weeks. Grade I bleeding was more frequent in MVA (69% vs 13%), while higher grades occurred more in EVA (p<0.001). Pain was also lower with MVA (Grade I: 37% vs 0%; Grade IV: 7% vs 54%; p<0.001). Overall complications (p=0.215) and post-abortal contraceptive practices (p=0.345).

Conclusion: Manual Vacuum Aspiration and Electric Vacuum Aspiration are both safe and effective techniques for surgical termination of pregnancy up to 10 weeks. MVA is particularly advantageous in resource-limited settings, while EVA may be more suitable in facilities with adequate infrastructure. The choice of method should be individualized based on patient preference, clinical setting, and resource availability.

Keywords: Manual Vacuum Aspiration, Electric Vacuum Aspiration, Surgical abortion, First-trimester pregnancy, Pregnancy termination.

Introduction

Termination of pregnancy is one of the most common gynecological procedures performed globally, particularly in the first trimester, and it plays a crucial role in safeguarding women's reproductive health. According to the World Health Organization (WHO), nearly half of all pregnancies

worldwide are unintended, and a significant proportion of these end in abortion, with the majority occurring within the first 12 weeks of gestation [1]. Safe abortion services are therefore an essential component of comprehensive reproductive health care, reducing maternal morbidity and mortality associated with unsafe methods. Surgical abortion methods, especially aspiration techniques, have gained prominence due to their safety, efficacy, and acceptability compared to older methods such as dilation and curettage (D&C) [2].

Vacuum aspiration, either manual or electric, has emerged as the standard of care for early pregnancy termination up to 12 weeks gestation. Manual Vacuum Aspiration (MVA) involves the use of a hand-held, syringe-like device to create suction, whereas Electric Vacuum Aspiration (EVA) uses an electrically powered suction machine. Both techniques function on the same principle of negative pressure to evacuate uterine contents but differ in terms of equipment, logistics, and applicability in different healthcare settings [3]. Compared with sharp curettage, aspiration methods are associated with lower complication rates, reduced blood loss, shorter procedure time, and faster recovery, making them safer alternatives for first-trimester abortion [4].

MVA has been widely promoted by international agencies, particularly in low- and middle-income countries, because it is cost-effective, does not require electricity, is portable, and can be performed in peripheral centers with minimal infrastructure. This makes it especially suitable in resource-constrained settings where access to higher-level facilities is limited [5]. Additionally, MVA can be safely performed under local anesthesia, reducing the need for general anesthesia and associated risks. EVA, on the other hand, though requiring electric power and hospital-based infrastructure, offers advantages such as consistent suction pressure, reduced operator fatigue, and ease of handling larger volumes of uterine contents [6]. Both methods, however, have their unique indications, benefits, and limitations, necessitating comparative evaluation in clinical practice. Several studies have demonstrated that the success rate of complete uterine evacuation with both MVA and EVA exceeds 95%, with minimal requirement for repeat procedures [7]. Complications such as hemorrhage, uterine perforation, cervical laceration, and pelvic infection are rare but can occur with either method. While EVA may provide a more comfortable experience for the operator, MVA is often preferred by patients in rural or semi-urban settings due to its accessibility and affordability. Furthermore, in the context of post-abortion care, MVA has been integrated into training programs for mid-level providers, thereby expanding the pool of healthcare personnel capable of providing safe abortion services [8].

From a public health perspective, the choice between MVA and EVA has important implications. In countries like India, where maternal mortality due to unsafe abortion remains a preventable cause of death, improving access to safe, simple, and effective methods is a priority [9]. National guidelines and international bodies advocate the use of aspiration techniques over sharp curettage, and there is a growing emphasis on equipping primary healthcare centers with MVA kits to enhance safe abortion coverage. At the same time, in tertiary care centers with adequate infrastructure, EVA continues to be widely practiced, especially in cases where repeat procedures or management of incomplete abortion are required.

Given this background, a direct comparative analysis of MVA and EVA in terms of safety, efficacy, complications, procedure time, and patient satisfaction is warranted. Such studies help guide evidence-based policy and clinical decisions, ensuring that women receive the most appropriate care based on their clinical profile and the healthcare setting. This comparative study therefore aims to evaluate the outcomes of MVA versus EVA in pregnancy termination up to 10 weeks gestation, contributing to the growing body of evidence on safe abortion practices and helping optimize service delivery in diverse healthcare contexts [10].

Materials and Methods

Study Design: Hospital based prospective randomized comparative study.

Place of study: The Study was carried out in the department of Obstetrics & Gynecology, Chittaranjan Seva Sadan College of Obstetrics, Gynaecology and Child Health.

Period of study: One Year.

Study Population: All patients coming to gynecology opd for mtp and fulfilling the criteria for mtp given by Government of India were selected.

Study Variables

- Age
- Gravida
- Pog
- Locality
- Socioeconomic Status
- Cause
- Bleeding
- Complications
- Pain
- Post Abortal Contraceptive

Sample Size: Two Hundred (200) Women admitted with the diagnosis of first trimester less than or equal to ten weeks abortion.

Inclusion Criteria: Women in the reproductive age group with history of <=10 weeks gestation irrespective of any parity with

- threatened abortion
- missed abortions
- incomplete abortions
- failed medial abortion

Exclusion Criteria

Women with (a)>10 weeks gestational periods.

- Ectopic pregnancy
- Pregnancy with Fibroid uterus or uterine anomalies
- Molar pregnancy
- Unwilling patent
- pelvic infections
- bleeding disorders

Statistical Analysis: Continuous variables are expressed as Mean, Median and Standard Deviation and compared across the groups using Mann-Whitney U test. Categorical variables are expressed as Number of patients and percentage of patients and compared across the groups using Pearson's Chi Square test for Independence of Attributes/ Fisher's Exact Test as appropriate.

The statistical software SPSS version 22 has been used for the analysis. An alpha level of 5% has been taken, i.e. if any p value is less than 0.05 it has been considered as significant.

Result

Table 1: Comparison of Demographic and Clinical Characteristics between MVA and EVA Groups (n=200)

		MVA	EVA	Total	P-Value	Significance
Age (Years)	≤20	10(10)	15(15)	25(12.5)	0.466	Not Significant
	21-25	38(38)	28(28)	66(33)		
	26-30	33(33)	36(36)	69(34.5)		
	31-35	13(13)	17(17)	30(15)		
	>35	6(6)	4(4)	10(5)		
	Total	100(100)	100(100)	200(100)		
Gravida	Primi-gravida	12(12)	13(13)	25(12.5)	0.74	Not Significant
	GravidaII	17(17)	12(12)	29(14.5)		
	GravidaIII	26(26)	30(30)	56(28)		
	GravidaIV	26(26)	22(22)	48(24)		
	GravidaV	19(19)	22(22)	41(20.5)		
	GravidaVI	0(0)	1(1)	1(0.5)		
	Total	100(100)	100(100)	200(100)		
POG(Weeks)	5	5(5)	0(0)	5(2.5)	0.02	Significant
	6	28(28)	16(16)	44(22)		
	7	3(3)	2(2)	5(2.5)		
	8	40(40)	44(44)	84(42)		
	9	3(3)	10(10)	13(6.5)		
	10	21(21)	28(28)	49(24.5)		
	Total	100(100)	100(100)	200(100)		
Locality	Rural	26(26)	31(31)	57(28.5)	0.434	Not Significant
	Urban	74(74)	69(69)	143(71.5)		
	Total	100(100)	100(100)	200(100)		
Socioeconomic Status	Lower	77(77)	64(64)	141(70.5)	0.044	Significant
	Middle	23(23)	36(36)	59(29.5)		
	Total	100(100)	100(100)	200(100)		
Cause	Failed Contraception	70(70)	66(66)	136(68)	0.457	Not Significant
	Failed Medical Method	3(3)	4(4)	7(3.5)		
	Incomplete Abortion	7(7)	15(15)	22(11)		
	Missed Abortion	12(12)	9(9)	21(10.5)		
	Unmarried	7(7)	6(6)	13(6.5)		
	Others	1(1)	0(0)	1(0.5)		
	Total	100(100)	100(100)	200(100)		

Table 2: Comparison of Blood Loss and Duration of Hospital Stay between MVA and EVA across Gestational Weeks

POG (Weeks)	Procedure	Mean Blood Loss (ml)	Median (ml)	Std. Deviation	P-Value	Significance
5	MVA	20.68	20.8	0.18	NA	NA
6	MVA	23.5	23.55	0.19	<0.001	Significant
	EVA	27.5	27.9	0.64		
7	MVA	28.5	28.5	0.1	0.076	Not Significant
	EVA	32.3	32.3	0		
8	MVA	28.46	28.5	0.14	<0.001	Significant
	EVA	35.03	35	0.94		
9	MVA	33.4	33.4	0	0.01	Significant
	EVA	38.86	38.9	0.23		
10	MVA	36.29	36.2	0.59	<0.001	Significant
	EVA	43.49	43.5	0.22		
5	MVA	6	6	0	NA	NA
6	MVA	6.5	6	0.79	<0.001	Significant
	EVA	14.13	15	1.63		
7	MVA	6.67	6	1.15	0.068	Not Significant
	EVA	15	15	0		
8	MVA	6.48	6	0.78	<0.001	Significant
	EVA	14.02	15	1.49		
9	MVA	6.67	6	1.15	0.005	Significant
	EVA	13.2	12	1.93		
10	MVA	6.33	6	0.58	<0.001	Significant
	EVA	13.96	15	1.43		

Table 3: Comparison of Bleeding, Complications, Pain, and Post-Abortal Contraceptive Use Between MVA and EVA Groups

		MVA	EVA	Total	P-Value	Significance
Bleeding	Grade I	69(69)	13(13)	82(41)	<0.001	Significant
	Grade II	26(26)	50(50)	76(38)		
	Grade III	5(5)	37(37)	42(21)		
	Total	100(100)	100(100)	200(100)		
Complications	No Complication	93(93)	81(81)	174(87)	0.215	Not Significant
	Cervical Laceration	0(0)	3(3)	3(1.5)		
	Drug Sensitivity	0(0)	1(1)	1(0.5)		
	Headache	3(3)	5(5)	8(4)		
	Incomplete (diagnosed by USG)	1(1)	4(4)	5(2.5)		
	Nausea	1(1)	3(3)	4(2)		
	Vomitting	2(2)	3(3)	5(2.5)		
	Total	100(100)	100(100)	200(100)		
Pain	Grade I	37(37)	0(0)	37(18.5)	<0.001	Significant
	Grade II	27(27)	13(13)	40(20)		
	Grade III	29(29)	33(33)	62(31)		
	Grade IV	7(7)	54(54)	61(30.5)		
	Total	100(100)	100(100)	200(100)		
Post Abortal Contraceptive	None	16(16)	17(17)	33(16.5)	0.345	Not Significant
	Barrier Method	1(1)	0(0)	1(0.5)		
	IUCD	21(21)	12(12)	33(16.5)		
	OCP	15(15)	14(14)	29(14.5)		
	Tubectomy	47(47)	57(57)	104(52)		
	Total	100(100)	100(100)	200(100)		

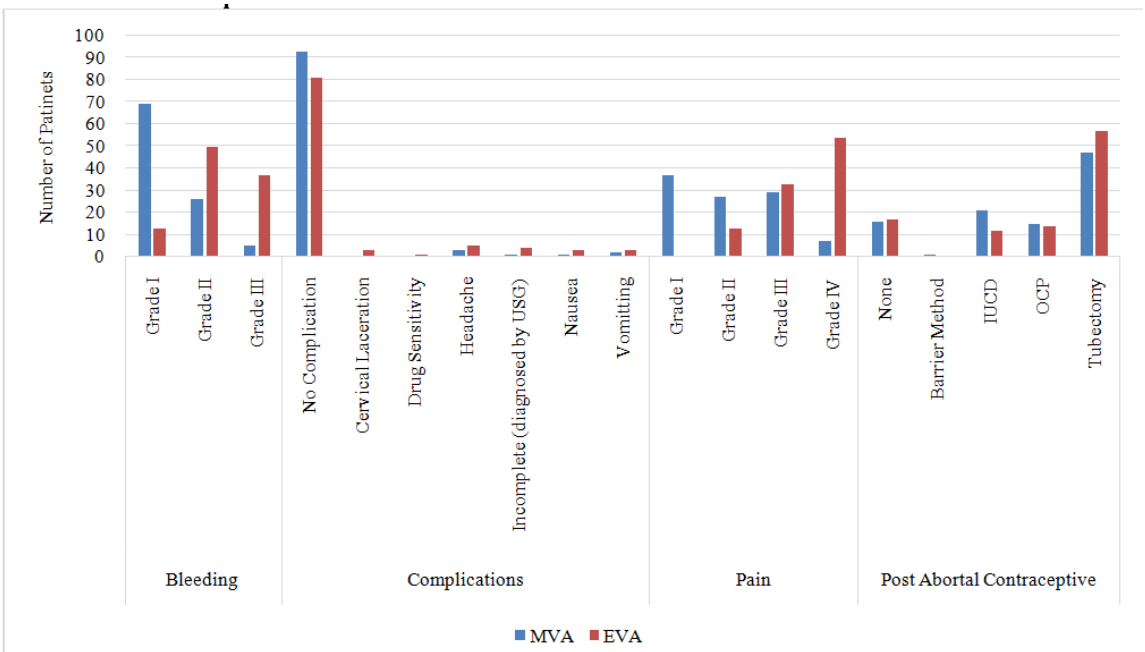

Figure 1: Comparison of Bleeding, Complications, Pain, and Post-Abortal Contraceptive Use Between MVA and EVA Groups

In this study of 200 patients, the age distribution was comparable between MVA and EVA groups, with the majority in the 21–30 years age range, and the difference was not statistically significant (p=0.466). Gravida status was also similar across groups, with no significant difference (p=0.74). The distribution of gestational age (POG) showed a significant difference (p=0.02), with more patients at 5 weeks in the MVA group and more at 10 weeks in the EVA group. Locality (rural vs urban) did not differ significantly between groups (p=0.434). Socioeconomic status showed a significant difference (p=0.044), with a higher proportion of lower socioeconomic patients in the MVA group. The cause of abortion, including failed contraception, failed medical method, incomplete abortion, missed abortion, and unmarried status, was similar between groups, with no significant difference (p=0.457).

The study evaluated blood loss and hospital stay in patients undergoing MVA and EVA from 5 to 10 weeks of gestation. Blood loss increased with advancing gestational age in both procedures, with EVA consistently showing higher mean blood loss than MVA. The difference in blood loss was statistically significant at 6, 8, 9, and 10 weeks, while at 7 weeks it was not significant (p=0.076). Similarly, the duration of hospital stay was shorter for MVA across all gestational ages, ranging from 6 to 6.67 days, compared to EVA, which ranged from 13.2 to 15 days. The difference in hospital stay was statistically significant at 6, 8, 9, and 10 weeks, and not significant at 7 weeks (p=0.068).

The analysis of post-procedural outcomes revealed significant differences in bleeding and pain between MVA and EVA groups. Grade I bleeding was significantly more common in the MVA group (69%) compared to EVA (13%), while higher grades (II and III) were more frequent in EVA (p<0.001). Pain severity also differed significantly; Grade I pain was observed in 37% of MVA cases and none in EVA, whereas Grade IV pain was markedly higher in EVA (54%) compared to MVA (7%) (p<0.001). However, the overall incidence of complications such as cervical laceration, drug sensitivity, headache, incomplete abortion, nausea, and vomiting did not differ significantly between the groups (p=0.215). Post-abortal contraceptive practices, including IUCD, OCP, tubectomy, and barrier methods, were comparable between groups with no statistically significant difference (p=0.345).

Discussion

In this study of 200 patients undergoing first-trimester pregnancy termination, MVA demonstrated favorable outcomes in terms of blood loss, pain, hospital stay, and post-procedural complications, consistent with previously published literature. The mean age of patients was comparable between MVA and EVA groups (21–30 years being most common), similar to findings by Kerure et al. [11] and Singh et al. [12], who reported that first-trimester terminations predominantly occur in women aged 20–30 years.

Our demographic analysis showed no significant difference in gravida status and locality between groups, aligning with observations by Patil et al. [13], suggesting that parity and residential background do not significantly influence

procedure selection. Regarding gestational age, a higher proportion of patients at 5 weeks underwent MVA, whereas more patients at 10 weeks underwent EVA, consistent with Tasnim et al. [14], who noted that early gestational age often favors MVA due to technical ease and lower complication rates. Blood loss was consistently lower in the MVA group across gestational ages, with statistically significant differences at 6, 8, 9, and 10 weeks, who also observed reduced intraoperative bleeding with MVA. Similarly, the duration of hospital stay was shorter for MVA patients (6–6.67 days) compared to EVA (13–15 days), corroborating by Singh et al. [15] and Dutta et al. [16], who emphasized the efficiency of MVA in reducing hospitalization and associated costs. Pain assessment showed that Grade I pain was more common in MVA (37%), whereas Grade IV pain was more frequent in EVA (54%), Maheshwari& Bharti [17], highlighting better patient comfort with MVA. Post-procedural complications were minimal and comparable between groups, with no statistically significant difference, in agreement with Kakinuma et al. [18]. Post-abortal contraceptive practices did not differ significantly between the groups, similar to the findings reported by Singh et al. [19]. Overall, functional and clinical outcomes demonstrate that MVA is a safe, effective, and patient-friendly alternative to EVA for first-trimester pregnancy termination, providing less blood loss, shorter hospitalization, lower pain scores, and comparable complication rates, supporting its preferential use in appropriately selected patients, and Singh et al. [20].

Conclusion

In this study, Manual Vacuum Aspiration (MVA) demonstrated clear advantages over Electric Vacuum Aspiration (EVA) for first-trimester pregnancy termination, including significantly lower blood loss, shorter hospital stays, and reduced pain, while maintaining comparable rates of post-procedural complications and contraceptive uptake. These findings, consistent with prior studies, suggest that MVA is a safe, effective, and patient-friendly procedure, particularly suitable for early gestational ages and resource-limited settings, and should be considered the preferred option for appropriately selected patients.

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