

“Vaginal Extraction Score” - To Predict Successful Vaginal Extraction of an Intact Uterine Specimen Following Laparoscopic Hysterectomy - Indian Scoring System

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Abstract: ***Background:** Tissue removal per vaginally in laproscopic hysterectomy can be challenging with large uterine size, nulliparous status, associated ovarian mass/pelvic adhesions/endometriosis; causing increase in operation time, increased blood loss and opting for alternate methods to remove the specimen such as mini-laparotomy, manual morcellation or using a power morcellator, bisection or distortion of the uterine specimen. A careful pre-operative analysis of certain parameters that would influence the easy vaginal extraction of the uterine specimen in TLH is required in order to reduce the rates of conversion and risk of morcellation. **Objective:** To analyze different parameters and create a scoring system to predict the removal of an intact uterine specimen in laparoscopic hysterectomy. **Method:** A prospective observational cohort study was conducted on patients undergoing laparoscopic hysterectomy in Father Muller Medical College, Kankanady in department of OBG over 1 year (Jan-Dec, 2018) irrespective of the indication the extraction of specimen was attempted vaginally, intact/ bisection or coring of uterus was sought. Various parameters were evaluated based on preoperative history, clinical examination, ultrasound and intraoperative findings and outcome. The final outcome of the uterine specimen during the surgery was assessed and determined as intact or distorted. Potential predictor for an intact specimen was selected. Their cutoff points were derived and based on that a score was derived. **Result:** 100 patients underwent laparoscopic hysterectomy during the study period (Jan- Dec, 2018); out of which 73 specimens were extracted vaginally intact, whereas 27 were either bisected or distorted.1)Selection of potential predictors: Using chi square test and independent t test(for continuous variables), pathology(p<0.001), removal of adnexa(p=0.046), postmenopausal status(p=0.030), uterine width(p<0.001) and uterine size (<0.001) was found to be significant. 2) Cutoff points for the potential predictors: Using ROC curve analysis, cutoff of 7.85cm for uterine width and 11 weeks for uterine size was derived.3) Using the significant variables, score was created. Using the ROC curve analysis, the area under the curve was 0.877 with the cutoff value of the score being 2. **Conclusion:** Scoring systems makes it easier for the surgeon to make an appropriate decision whether a patient will be suitable for laparoscopy or abdominal hysterectomy without converting or distorting the uterine specimen. Our scoring system was created from variables that are available as a preoperative workup of any patient undergoing hysterectomy; making it an easier tool to use. Further research and study on a larger population may be required to validate the score and assess its sensitivity and specificity.*

Keywords: vaginal extraction score, laproscopic hysterectomy

1. Introduction

Hysterectomy is the most commonly practiced gynaecological procedure. Routes can be abdominal, vaginal and laparoscopically.

Laparoscopic hysterectomy is total hysterectomy that is performed laparoscopically,⁽¹⁾ where the tissue specimen is extracted vaginally and vaginal closure is done laparoscopically or vaginally. It is a minimally invasive route of hysterectomy.

A minimally invasive route of hysterectomy results in a more rapid recovery and fewer postoperative complications when compared to abdominal hysterectomy.⁽²⁾

Tissue removal per vaginally can be challenging with large uterine size, nulliparous status, associated ovarian mass/pelvic adhesions/endometriosis; causing increase in operation time, increased blood loss and opting for alternate methods to remove the specimen such as mini-laparotomy,

manual morcellation or using a power morcellator,⁽¹⁾ bisection or distortion of the uterine specimen.

In November 2014, the US FDA issued a “black box warning “discouraging power morcellator. They estimated 1 in 350 risks of uterine sarcoma⁽³⁾. Other studies have shown other associated concerns with morcellation such as dissemination of cervical and endometrial malignancy and dissemination of benign tissue which can lead to pain and need for reoperation; injury to surrounding structures and dissemination of specimen making pathological diagnosis difficult^(4,5,6)

A careful pre-operative analysis of certain parameters that would influence the easy vaginal extraction of the uterine specimen in TLH is required in order to reduce the rates of conversion to mini laparotomy and risk of morcellation

Aim:

To analyse different parameters and create a scoring system to predict the removal of an intact uterine specimen in laparoscopic hysterectomy.

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2. Materials and Methods

Ethical clearance was obtained from the hospital ethical committee. Our study was a prospective observational cohort study (7). 100 patients undergoing laparoscopic hysterectomy in Father Muller Medical College, Kankanady in department of OBG over 1 year (Jan-Dec, 2018) were included; irrespective of the indication the extraction of specimen was attempted vaginally, intact/ bisection or coring of uterus was sought.

We excluded all those patients who underwent emergency hysterectomy, peripartum hysterectomy, and cases where laparoscopy was converted to laparotomy for surgical difficulties.

The following characteristic was collected: preoperative history, clinical examination, ultrasound and intraoperative findings and outcome.

History

- 1) Age(yrs.)
- 2) Parity
- 3) Mode of previous deliveries
- 4) Postmenopausal status
- 5) H/O previous surgeries

Clinical Examination

- 1) Uterine size(weeks)
- 2) Vaginal breadth(fingers)
- 3) POD/fornicial fullness
- 4) Vaginal descent

Radiology

- 1) Uterine width
- 2) Pathology

Intra-Operative:

- 1) Adhesions(Present/Absent)
- 2) Removal Of Adnexa

These parameters were chosen based on the responses from experienced gynaecologists and after referring previous studies done on scoring systems for vaginal and laparoscopic hysterectomies (1,4,11,13)

The final outcome of the uterine specimen during the surgery was assessed and determined as intact or distorted.

Intact was defined as uterus with cervix delivered in toto without bisection or coring.

These parameters were analysed. Based on those factors favouring the removal of an intact specimen, a score was created (refer figure1)

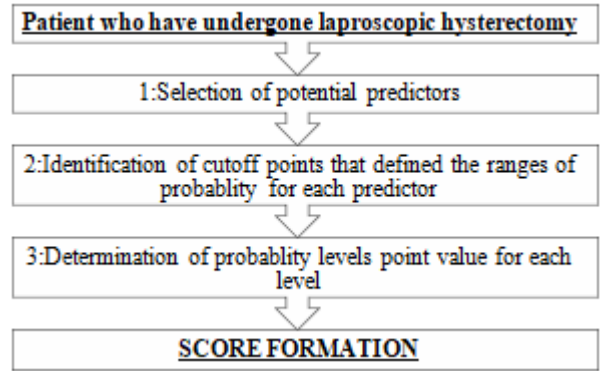


Figure 1

Tables and Figures

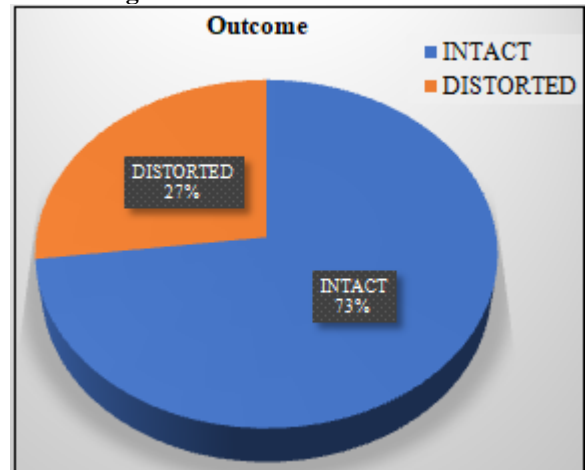


Figure 2: Outcome

Chi Square Tests for Comparison of the Parameters Between Intact and Distorted/Bisected

Table 1>History

		Intact count (%)	Distorted/ Bisected count (%)	P Value
Age (yrs.)	<40	3(4.2%)	5(18.5%)	0.210
	41-45	17(23.6%)	7(25.9%)	
	46-50	35(47.2%)	10(37%)	
	51-55	11(15.3%)	3(11.1%)	
	>=56	7(9.7%)	2(7.4%)	
Parity	0	5(6.9%)	2(7.4%)	0.974
	1	7(9.7%)	4(14.8%)	
	2	36(48.6%)	12(44.4%)	
	3	17(23.6%)	7(25.9%)	
	>=4	8(11.2%)	2(7.4%)	
Mode of Previous Deliveries	Nulliparous	5(6.9%)	2(7.4%)	0.937
	LSCS	4(5.6%)	2(7.4%)	
	NVD	64(87.5%)	23(85.2%)	
Postmenopausal Status	No	57(77.8%)	26(96.3%)	0.030
	Yes	16(22.2%)	1(3.7%)	
H/O Pelvic Surgeries	No	58(79.2%)	25(92.6%)	0.115
	Yes	15(20.8%)	2(7.4%)	

Table 2>Clinical Examination

		Intact count (%)	Distorted/Bisected count (%)	P value
Vaginal Breadth (fingers)	<2fingers	16(22.2%)	5(18.5%)	0.915
	2fingers	18(23.6%)	7(25.9%)	
	>2fingers	39(54.2%)	15(55.6%)	
POD/ Fornicial Fullness	NO	62(84.7%)	17(63%)	0.115
	>1fornices	2(2.8%)	1(3.7%)	
	Anterior	2(2.8%)	2(7.4%)	
	POD/lateral	7(9.7%)	7(25.9%)	
Vaginal Descent	NO	64(87.5%)	24(88.9%)	0.850
	1 st degree	9(12.5%)	3(11.1%)	

Table 3>Radiology

		Intact count (%)	Distorted/Bisected count (%)	P value
Pathology	AUB-A	5(6.9%)	2(7.4%)	<0.001
	AUB-L	23(31.9%)	25(92.6%)	
	AUB-M, P	45(61.1%)	0	

Table 4>Intraoperative

		Intact count (%)	Distorted/Bisected count (%)	P value
Adhesions (present/absent)	No	60(81.9%)	23(85.2%)	0.703
	Yes	13(18.1%)	4(14.8%)	
Removal Of Adnexa	No	13(18.1%)	10(37%)	0.046
	Yes	60(81.9%)	17(63%)	

Table 5>Comparison of the continuous variables using independent t test

	Outcome	N	Mean	Std. Deviation	T	Df	P Value
Age	Intact	73	48.600	6.150	1.965	97	0.052
	Distorted/Bisected	27	45.930	5.670			
UT Width (cm)	Intact	73	7.118	1.512	-3.986	97	<0.001
	Distorted/Bisected	27	8.537	1.743			
Uterus Size (wks.)	Intact	73	8.611	2.140	-4.19	34.482	<0.001
	Distorted/Bisected	27	11.482	3.309			

Table 6>Using Binary Logistic Regression for Odd Ratio of Predicting Distortion

	P value	Odds ratio	95% C.I. for odds ratio	
			Lower	Upper
AUB-M, P	.688			
AUB-A	.997	323207474.249	.000	.
AUB-L	.997	722837759.692	.000	.
UT WIDTH (cm)	.256	1.225	.863	1.739
Adnexa Not Removed	.655	1.321	.389	4.485
Not Postmenopausal	.433	2.821	.211	37.692
Uterus Size (wks.)	.075	1.222	.980	1.523

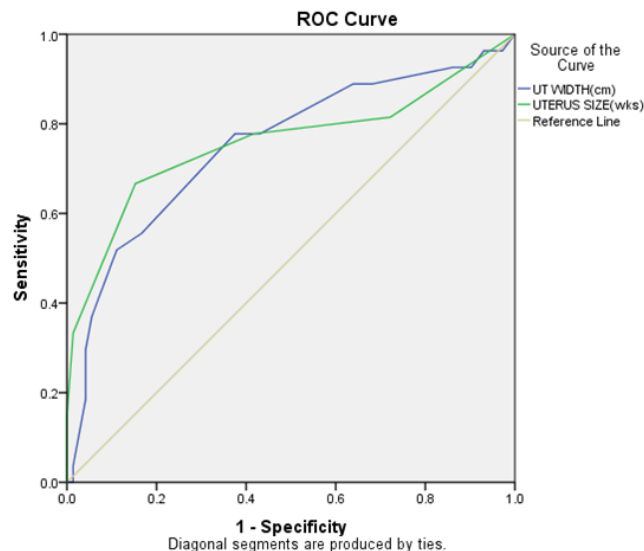


Figure 3: ROC curve analysis for UT width and uterus size

Area under the curve of .7 and above means good predictability

Parameter	Sensitivity	Specificity	PPV	NPV	Diagnostic Accuracy	P Value
UT Width (cm) (cut-off of 7.85)	77.80%	62.50%	43.80%	88.20%	66.67%	0.0010
Uterus Size (wks.) cut-off of 11	66.70%	84.70%	62.10%	87.10%	79.80%	<0.001

Table 7> Using the Cutoffs from the ROC Curve

		Intact count (%)	Distorted/Bisected count (%)	P value
Uterine Width(CMS)	<=7.85	46(62.5%)	6(22.2%)	0.001
	>7.85	27(37.5%)	21(77.8%)	
Uterine Size (wks.)	<=11	62(84.7%)	9(33.3%)	<0.001
	>11	11(15.3%)	18(66.7%)	

Table 8>using the significant 5 variables; scoring system was created

	Score 1	Score 0
Pathology	AUB L OR AUB A	AUB MP
UT WIDTH	>7.85	<=7.85
Adnexa Removed	NO	YES
Post Menopausal	NO	YES
Uterus Size	>11	<=11

Max score=5, minimum score=0

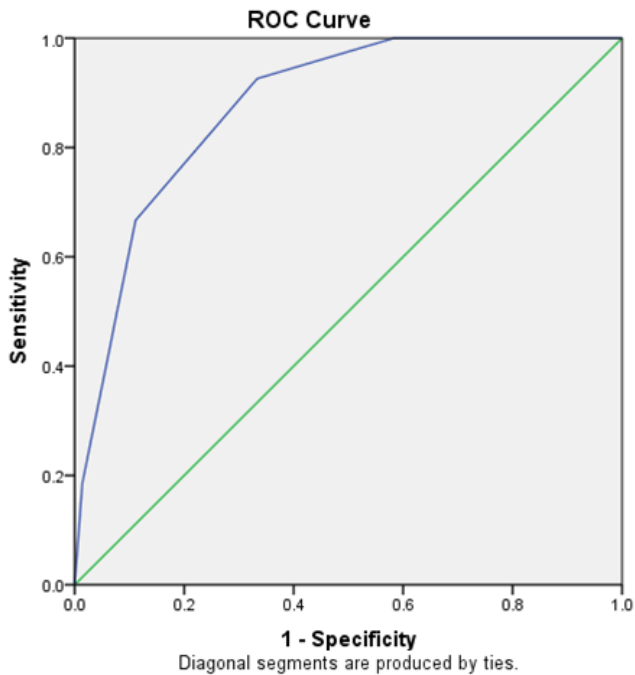


Figure 4: ROC curve for the score

Cutoff of 2 would be Ideal for the Sensitivity and Specificity of the Score

≤ 2 : likely to have an intact uterine specimen when extracted vaginally

3. Results

100 patients underwent laparoscopic hysterectomy during the study period (Jan- Dec, 2018); out of which 73 specimens were extracted vaginally intact, whereas 27 were either bisected or distorted. (Figure2)

Majority of the patients belonged to the age group of 46-50years (44.4%), para 2(47.5%), with previous vaginal deliveries (86.9%), with history of previous pelvic surgeries (17.2%) and were postmenopausal (17.2%). (Table1)

On clinical examination, uterine size (bimanual examination), vaginal breadth (fingers), POD/fornicial fullness, vaginal descent was analyzed. Uterine size being a continuous variable was analyzed separately. The remaining 3, using chi square test was found to be insignificant ($p > 0.05$). (Table2)

Most of the patients in the study population had fibroid uterus (AUB-L) (48.5%) as their pathology (Table3). Intraoperatively, most of the patients had their adnexa also removed (76.8%), with adhesiolysis (14.8%). (Table4)

Step1: Selection of potential predictors

Using chi square test on all the variables, pathology ($p < 0.001$), removal of adnexa ($p = 0.046$), postmenopausal status ($p = 0.030$) was found to be significant.

For continuous variables (age, uterine size, uterine width) independent t test was used, age was not found to be significant; whereas uterine width ($p < 0.001$) and uterine size (< 0.001) was found to be higher in distorted group. (Table 5)

Step2:

A) Using binary logistic regression for odd's ratio for predicting distortion, the following were likely to have a distorted specimen (Table 6)

- AUB-L and AUB-A (high odd's ratio)
- Lack of postmenopausal status (2.8 times the odds)
- Not removing the adnexal mass (1.3 times the odds)

B) Using ROC curve analysis, cut off values for uterine width and uterine size was derived to determine distortion, uterine width cutoff of 7.85cm was found to be 77.8% sensitive and 62.5% specific; uterine size cutoff of 11 weeks was found to be 66.7% sensitive and 84.7% specific. (Figure 3)

Step3: Using the significant variables, score was created (Table 8)

Using the ROC curve analysis, the area under the curve was 0.877 with the cutoff value of the score being 2. (Figure 4) less than/equal to 2, likely to have an intact uterine specimen; more than 2, likely to have a distorted uterine specimen.

4. Discussion

100 patients underwent laparoscopic hysterectomy (LAVH, TLH) in the year 2018(JAN-DEC); after analyzing 13 variables; 5 significant parameters were selected and a score was created.

Many studies have been conducted in the past where the uterine specimen was extracted vaginally; both in laparoscopy or vaginal hysterectomy; and they found uterine volume and uterine weight useful in predicting the need to morcellate the specimen in these surgeries. But this was derived using complex equations to estimate preoperatively. (8; 9;10)

In our study we wanted to create a score from variables that was easily available without involving any complex equation and derive a cut off. Hence in our study the uterine dimensions that have been considered were available to us clinically (uterine size in weeks) or radiologically (uterine width).

A retrospective study conducted by Morgan Wolfe et al⁽¹¹⁾ analyzed preoperative factors to predict the need to morcellate in TLH; and they found uterine size of 11.5 weeks to be one of the predictors with a sensitivity of 87% and specificity of 87%; similar were the findings in our study where the uterine size cutoff was found to be 11 weeks and was one of the main contributors to the score. This correlated well to another Indian study conducted by TG Revathy et al⁽¹²⁾ where they found uterine size of 12-18 weeks required several debulking techniques.

Studies have shown that nulliparity increased the odds of morcellation⁽⁹⁾; whereas in our study parity had no significance on the outcome of the specimen. This could be attributed to the small study population and the number of nulliparous women($n=5$) among them. But our findings correlated to other similar studies with bigger study population^(11, 13) where nulliparity had no significance.

A study similar like ours was done by Mohling S et al⁽¹³⁾ on vaginal extraction index to predict pre operatively the successful extraction of the specimen vaginally during laparoscopic vaginal hysterectomy involved age, uterine length, uterine width, uterine height. But the uterine parameters were considered from the pathology reports, unlike our study which was based on clinical and radiological parameters. Age >50yrs earned one point in Mohling's score; but in our study age was found insignificant to find a place in our score. The reason could be that majority of our patients were between 46-50 and approximately 20% were above 50.

A separate score was created by Dr Sarita Kakatkar, "SLOPE" Score⁽¹⁴⁾ for fibroid uterus in hysterectomies in view of intraoperative difficulties with fibroid uterus and influencing the uterine dimensions, making the uterine specimen extraction difficult vaginally. Hence in our study AUB-L was significant and individually had a higher score.

Menopausal status was found to be significant in our study, even in the study conducted by Holly RN Sato et al⁽⁸⁾, there was decreased likelihood of morcellation if the patient was menopausal. But Wolfe et al found no significance to successful vaginal extraction and menopausal status.

Studies have shown that removal of adnexa decrease the need for conversion or morcellation^(8; 15), as it increases the mobility of the uterus, making the surgery easier. The findings were similar in our study and the parameter was included in the score.

Previous lscs increase adhesions and predispose to bladder repair and there have been increased risk of conversion in various studies⁽¹⁵⁾; but in our study there was not any significance between the outcome and previous mode of deliveries.

Strengths v/s Limitations

Our study was prospective and involved the analysis of 10 parameters that are usually available pre operatively for any patient undergoing hysterectomy and did not involve any complex equation. But small study population with a short study period would contribute to our limitations.

5. Conclusion

Scoring systems makes it easier for the surgeon to make an appropriate decision whether a patient will be suitable for laparoscopy or abdominal hysterectomy without converting or distorting the uterine specimen. Our scoring system was created from variables that are available as a preoperative workup of any patient undergoing hysterectomy; making it an easier tool to use.

Further research and study on a larger population may be required to validate the score and assess its sensitivity and specificity.

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