

Original Research Article

MAST CELL DISTRIBUTION IN ENDOMETRIAL LESIONS- A RETROSPECTIVE STUDY IN A TERTIARY CARE HOSPITAL OF WESTERN UTTAR PRADESH

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ABSTRACT

Background: Mast cells play important role in a variety of biological responses including inflammation, body's defense against viral, bacterial and parasitic infections and are key effector cells in both innate and acquired immunity. **Aims and Objectives:** The study was conducted to find out concentration of mast cells in various lesions of endometrium and to find out a correlation, if any, between clinical profile, histopathology and mast cell concentration.

Material and Methods: A retrospective study on 577 hysterectomy specimens, received in 10% formal saline was done. Sections were taken, processed and stained with H & E stain and 1% toluidine blue for mast cells.

Results: Highest statistically significant mean mast cell count was observed in polyps followed by secretory phase when compared to proliferative phase. A statistically significant decrease in mean mast cell count was seen in atrophic endometrium, hyperplasia and endometrial carcinoma

Conclusions: Increase in mast cell count is associated with benign lesions when compared to malignant lesions.

Keywords: Endometrium, mast cells, hysterectomy.

INTRODUCTION

Mast cells (MCs) were first described in 1878 by Paul Ehrlich as metachromatically staining basophilic cells found in connective tissues.^[1] Even after more than hundred years of their discovery, these cells continue to fascinate health researchers. Mast cells play a pivotal role in a variety of biological responses including inflammation, angiogenesis,^[2] physiological wound healing, fibrosis,^[3] and tissue remodelling.

Mast Cells are the progeny of multi potential haematopoietic stem cells.^[3,4] However in contrast to basophils and other leucocytes they complete their final phenotypic differentiation and maturation in extra vascular areas and usually cannot be found in the peripheral blood.^[3]

For centuries owing to its vulnerability towards a wide spectrum of benign and malignant diseases, the female reproductive system has remained a subject of fascination. Although there is little information about the distribution and heterogeneity of mast cells in human uterine tissues, it is believed that myometrium

is rich in mast cells.^[5] The greatest number of mast cells are localised in the inner half of the myometrium while the outer half contains comparatively fewer numbers.^[6] In contrast, endometrium contains significantly lower number of mast cells. They are present in endometrial stroma in fairly constant numbers throughout the menstrual cycle, however they undergo extensive activation prior to menstruation and are thus assumed to play important functional role in regulating menstruation.^[5-9]

Some authors have reported an increase in mast cells during the secretory phase of menstrual cycle.^[10] While others have reported no significant change in the number of mast cells in different phases of the menstrual cycle.^[11] An increase in number of mast cells have been reported in abnormal uterine bleeding.^[7,12-15] This study was conducted to find out concentration of mast cells in various lesion of endometrium, and to find out a correlation, if any, between clinical profile, histopathology and mast cell concentration.

MATERIALS AND METHODS

The present study was conducted on hysterectomy specimens received from department of Obstetrics and Gynaecology in a tertiary care hospital of Western Uttar Pradesh for a period of 2 years. The study was conducted after taking institutional ethical clearance.

Sample size: A total of 577 hysterectomy samples were selected.

Study Design: Hospital based Observational study

Study Population: The cases of abnormal uterine bleeding coming to Department of Obstetrics and Gynaecology who underwent hysterectomy were included in the study.

Duration of study: 2 years

Inclusion Criteria: All hysterectomy specimens in the study period were included

Exclusion Criteria: Uterus with retained products, biopsy tissues were excluded from the study

Methods: Gross examination of samples was done thoroughly. Then sections were taken from uterus including endometrium and myometrium. Tissues from all the cases were processed, sections were stained by H&E Stain for routine histological

examination and Toluidine Blue,^[16] for examining mast cells. Categorisation of the lesions was done on histological grounds. Number of mast cells in ten consecutive high power fields (HPF) were counted in all sections of endometrium.

Controls: The proliferative phase was taken as controls for the endometrial lesions. Skin biopsy acted as a positive control for mast cells.

Statistical Analysis: The data was entered in Microsoft Excel and statistical analysis was carried out using SPSS 17,^[17] package. Percentages and mean values were calculated and compared using Pearson's chi square test and ANOVA test. P value of <0.05 was accepted as indicative of statistical significance at 95% confidence interval.

RESULTS

The majority of patients (336/577, 58.23%) belonged to perimenopausal age group followed by reproductive age group (151 cases, 26.34%) and 89 cases, 15.34% were post menopausal. (Table 1.) Patients presented with menstrual disturbances, pain in abdomen, lump in abdomen. (Table 1.)

Table 1: Demographic Data of 577 cases

Age groups (in years)	Number of Cases	Percentage
<40	152	26.34
40-50	336	58.23
>50	89	15.42
Menstrual Disturbances	Number of Cases	Percentage
Menorrhagia	189	32.76
Metrorrhagia	81	14.03
Menometrorrhagia	47	8.15
Polymenorrhagia	42	7.28
Polymenorrhoea	16	2.77
Post-menopausal bleeding	112	19.41
Dysmenorrhoea	73	12.65
Amenorrhoea	8	1.39
Absent	9	1.56

On histological examination proliferative phase was seen in highest number of cases (291/577, 50.43%), secretory phase (78/577, 13.52%), atrophic endometrium (131/577, 22.70%), chronic endometritis (09/577, 1.56%), endometrial polyp (18/577, 3.12%), endometrial hyperplasia (40/577, 6.93%) and endometrial carcinoma (10/577, 1.73%) [Table 1]

Table 2: Mast Cell profile of Endometrial Lesions in 577 Hysterectomy specimens

Endometrial lesion	No. of Cases	Mean Age (years)	Mean mast cell count / 10HPF	Standard Deviation	Range	P value*
Proliferative	291	40.21	9.02	4.50	1-25	
Secretory	78	38.12	13.54	7.07	2-28	<0.001
Atrophic	1315	52.81	4.46	3.64	0-16	<0.001
Endometritis	9	45.89	10.00	2.69	4-14	1.00
Endometrial Polyp	18	44.00	21.44	9.26	5-35	<0.001
Simple Hyperplasia	28	43.71	3.14	1.76	1-6	<0.001
Complex Hyperplasia	7	40.50	2.00	1.13	1-4	<0.001
Atypical Hyperplasia	5	41.67	2.00	1.11	0-4	<0.001
Endometrial Carcinoma	10	58.50	1.40	2.01	0-6	<0.001
Total	577	43.43	8.47	6.20	0-35	

*ANOVA test applied. Statistically significant difference for mast cell count within endometrium in relation to proliferative phase (control) $p < 0.001$.

As is evident from table number 2, a cyclical variation in the mast cell count was seen as an increase in the mast cells in the secretory phase (Table 2, Fig 2) when compared to the mean mast cell value in the proliferative phase (Fig1). This variation was statistically significant ($p < 0.001$).

Compared to proliferative phase there was statistically significant decrease in mean mast cell count for atrophic endometrium, simple (Fig 4), complex, atypical hyperplasia, and endometrial carcinoma.

In Endometrial polyps mean mast cell count was two times higher (Fig 3) than proliferative phase.

Table 3: Number of Mast cells in endometrium in 577 Hysterectomy cases

Histopathology of Endometrium	Range of Mast Cells/10 HPF				Total	P Value*
	0-10	11-20	21-30	31-40		
Proliferative	187 (64.26%)	100 (34.36%)	4 (1.37%)	-	291 (100%)	<0.001 ^a
Secretory	32 (41.02%)	28 (35.90%)	18 (23.08%)	-	78 (100%)	<0.135
Atrophic	116 (88.55 %)	15 (11.45%)	-	-	131 (100%)	<0.001 ^a
Endometritis	6 (66.67%)	3 (33.33%)	-	-	9 (100%)	<0.317
Endometrial Polyp	2 (11.11%)	6 (33.33%)	7 (38.89%)	3 (16.67%)	18 (100%)	<0.286
Simple Hyperplasia	28 (100%)	-	-	-	28 (100%)	-
Complex Hyperplasia	5 (100%)	-	-	-	5 (100%)	-
Atypical Hyperplasia	7 (100%)	-	-	-	7 (100%)	-
Endometrial Carcinoma	10 (100%)	-	-	-	10 (100%)	-
Total	393 (68.11%)	152 (26.34%)	29 (5.03%)	3 (0.52%)	577 (100%)	<0.001 ^a

*X² chi square test applied

^astatistically significant difference of mast cells within the endometrium $p < 0.001$

Table 3 shows range of mast cells in endometrium in 10 high power fields.

The maximum number of cases of proliferative, secretory and atrophic endometrium had mast cells

between 0-10/10 HPF, few cases of endometrial polyps had 30-40 mast cells / 10 HPF. Number of mast cells were decreased in hyperplastic endometrium and in cases of endometrial carcinoma.

Table 4: Age wise distribution of the mean mast cell count in endometrial lesions

Histopathology diagnosis Endometrium	Reproductive (>40 years)			Perimenopausal (40-50 years)			Postmenopausal (> 50 years)			TOTAL			P Value*
	Mast cell count			Mast Cell Count			Mast Cell Count			Mast Cell Count			
	Case	Mean	range	Case	Mean	Range	Case	Mean	Range	Case	mean	Range	
Proliferative	92	12.59	3-25	198	7.40	1-16	1	2.00	2	291	9.02	1-25	<0.001 ^a
Secretory	40	17.68	3-25	38	9.18	2-27	0	0.00	0	78	13.54	2-28	<0.001 ^a
Atrophic	5	8.25	2-28	55	6.57	0-16	71	2.68	0-12	131	4.46	0-16	<0.001 ^a
Endometritis	3	11.67	2-12	3	10.00	10-11	3	8.33	4-12	9	10.00	4-14	0.362
Endometrial Polyp	2	35.00	11-80	14	21.50	30-35	2	7.50	5-10	18	21.44	5-35	0.004 ^a
Simple Hyperplasia	6	4.67	2-6	17	3.06	1-6	5	1.60	1-3	28	3.14	1-6	0.009
Complex Hyperplasia	2	2.22	2-4	3	3.33	1-3	0	0	0	5	2.21	1-4	0.009
Atypical Hyperplasia	1	1.00	1	6	1.56	1-3	0	0	0	7	1.56	1-3	0.007
Endometrial Carcinoma	1	1.00	1	2	1.00	1	7	1.57	0-6	10	1.40	0-6	0.936

*ANOVA Test Applied

^aStatistically significant difference for mast cell count within endometrium within different age groups $P < 0.05$

A significant inverse correlation between the mean number of mast cells with increasing age was observed in the proliferative, secretory, atrophic endometrium. A highly significant inverse

correlation between the mean number of mast cells with the increasing age in different endometrial pathologies was observed.

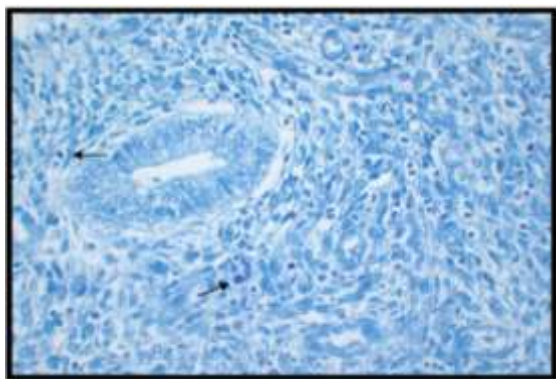


Figure 1: Photomicrograph of Mast cells in proliferative phase (Toluidine blue x 400)

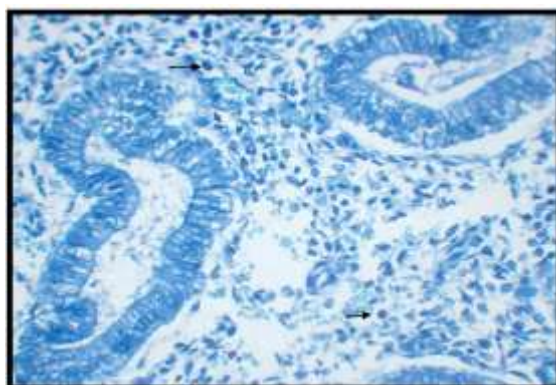


Figure 2: Photomicrograph of Mast cells in secretory phase (Toluidine Blue x 400)

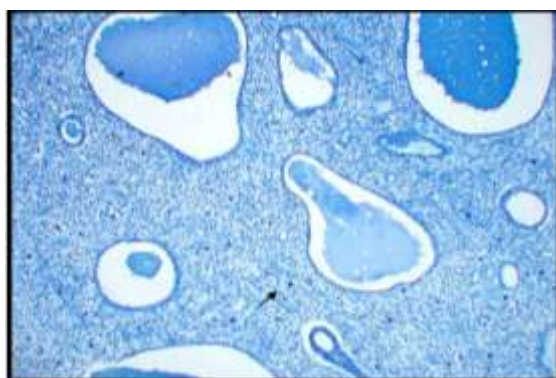


Figure 3: Photomicrograph of Mast cells in endometrial polyp (Toluidine Blue x 200)

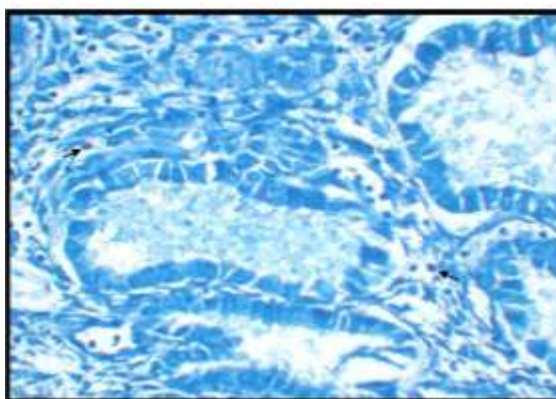


Figure 4: Photomicrograph of Mast cells in simple hyperplasia (Toluidine Blue x 400)

DISCUSSION

Mast cells are thought to play role in menstruation.^[18] In this study, a higher mean mast cell count was observed in the secretory phase compared to the proliferative and post menopausal stages. In this study a cyclical variation in the mast cell count was seen as an increase in mast cell in the secretory phase which showed a mean value of 13.54 ± 7.07 when compared to mean mast cell in the proliferative phase which was 9.02 ± 4.50 . This was statistically significant. These findings were similar to D'Souza et. al (1994),^[10] Patil R M et. al (2023),^[19] Sehdev R et. al. (2025).^[20]

These findings suggest that fluctuations in female sex hormones during the menstrual cycle may have potential influence on mast cell numbers within the uterus. However, Gousuddin et al(2015),^[21] observed that proliferative phase showed increased mast cell as compared to secretory phase, though not statistically significant. On the other hand, Mori et al(1997),^[5] (2001) Sivrandis et al,^[9] Drudy et al(1991),^[13] showed no significant change in mast cells counts in the different physiological phases of endometrium.

In the present study, a significant decrease (p value < 0.001) in mast cells count for atrophic endometrium (4.46 ± 3.64) was observed when compared to the proliferative phase which was similar to that of Mori et al(1997)^[5] and Sehdev R et al. (2025)^[20], in contrast Patil R M et al. (2023),^[19] reported increased mean mast cell count in atrophic endometrium. Comparison of the mean mast cell count in endometritis with proliferative phase showed no significant difference.

There was a statistically significant increase (p value < 0.001) in the mast cell count in endometrial polyps (21.44 ± 9.26) when compared to proliferative controls. Gousuddin et al,^[21] Al-Jefout et al,^[22] Patil R M et al. (2023),^[19] Yu Lin et al. (2025),^[23] observed a high density of activated mast cells in endometrial polyps.

This suggested a strong connection between mast cell proliferation and endometrial polyps. Yu Lin et al. (2025),^[23] found that WT-1 (Wilms Tumor-1) is a key regulatory factor in mast cell proliferation within endometrial polyps. They observed a correlation between WT-1 down regulation and mast cell proliferation such as decreased WT-1 levels lead to increase mast cell proliferation and activity.

There was a statistically significant low levels of mast cells in both complex hyperplasia (2.00 ± 1.13) and simple hyperplasia (3.14 ± 1.76) in the present study. A statistically significant decrease mast cell count was also observed by D'souza et al (1994).^[10] Patil R M et al. (2023),^[19] also reported a significantly decreased mast cells in atypical hyperplasia and mast cells were absent in endometrial carcinoma when compared to endometrial polyps. In the present study also mean mast cell count was found to be decreased in atypical hyperplasia and

endometrial carcinoma when compared to proliferative phase.

Goksu Enrol et al. (2011),^[24] have reported that they found no significant correlation between microvascular density and Tryptase positive mast cell density in endometrial carcinoma, as high grade carcinoma had a higher degree of vascularisation than lower grade carcinoma. They observed that mast cells were lower in endometrial carcinoma than benign lesions of uterus, but the benign lesions in their study were leiomyomas.

In contrast Ribatti et al (2005,2011),^[25,26] found that Tryptase positive mast cells increased in agreement with tumor progression from endometrial hyperplasia to endometrial adenocarcinoma and was highly correlated with angiogenesis. These results suggest that angiogenic Tryptase secreted by host mast cells co-operates in the induction of angiogenesis and neovascularisation in endometrial cancer and is related to tumor progression. Ribatti et al (2005,2011),^[25,26] had further found that Tryptase positive mast cell counts increase in accordance with progression of endometrial carcinoma. However, Pansrikaew et al (2010),^[27] reported that the mast cell density and the number of microvessels did not affect clinical progression or recurrence of endometroid endometrial cancer.

Various stains are used for staining mast cells. In this study 1% alcoholic Toluidine Blue stain was used. The procedure is simple, less time consuming and good contrast is obtained. Mast cells stain purplish pink against blue background.

It is concluded from the present study that there is cyclical variation in the mean mast cell count. Highest number is seen in endometrial polyps and lowest in endometrial carcinoma. Oner O et al. (2022),^[18] found the contribution of MMP-2, MMP-9 and mast cells in the etiopathogenesis of post menopausal polyps and patients receiving HRT. Lin Yu et al. (2025),^[23] found the role of WT-1 as a key regulatory factor in mast cell proliferation within endometrial polyps. They suggested further investigations are needed to validate WT-1's therapeutic potential and to explore its interaction with other signalling pathways in mast cell regulation. So, estimation of mast cell count may be an additional diagnostic and prognostic tool in different endometrial lesions. Their presence favours benign nature of the lesion.

CONCLUSION

Conflicts of Interest: None

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