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Utility of Urine Cytology as per The Paris System in Patients attending Birat Medical College

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ABSTRACT

Introduction: Urine Cytology is a cheap, simple and non-invasive diagnostic tool to detect urothelial carcinoma. Previously there was no common standard and reproducible system to report urine cytology. The Paris system of reporting urinary cytology was conceived to produce uniformity in reporting Urinary cytology. We have been reporting urine cytology in our institution by conventional method and we intend to adopt this standard reporting in our laboratory. Thus this study was conducted to assess the utility of urine cytology reporting as per The Paris System of Reporting Urinary Cytopathology.

Methods: This is a cross-sectional study conducted in the Department of Pathology, Birat Medical Teaching Hospital. Total enumeration sampling was done where all 57 voided as well as post instrumentation urine received over a period of 12 months was included in the study. Inadequate sample and patient not willing to take part in the study were excluded from the study. Cytological features were evaluated and classified according to the Paris system Histopathological features were evaluated and correlated wherever available.

Results: The sensitivity, specificity, positive predictive value and negative predictive value for detecting high grade lesions were 88.9%, 100%, 100% and 94.4% respectively. Similarly, sensitivity, specificity, positive predictive value and negative predictive value for detecting low grade lesions were 80%, 95.2%, 80% and 95.2% respectively.

Conclusions:

The standardized Paris system has high sensitivity, specificity, positive predictive value and negative predictive value in diagnosing urothelial malignancy especially High Grade Urothelial Carcinoma. Thus, we recommend to implement this Paris system in our routine urine cytology reporting.

Keywords: *Bladder carcinoma; cytology; cystoscopy; hematuria.*

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INTRODUCTION

Urine Cytology is a cheap, simple and non-invasive diagnostic tool to detect urothelial carcinoma, infections as well as stones. [1,2,3] Previously there was no common standard and reproducible system to report urine cytology. Thus many attempts were made to create a standard reporting guidelines. [4] Papanicolaou society of cytopathology Task force classification and Ooms et al published their classification. [4,5] Unfortunately the discrepancy, controversy and lack of uniformity in reporting urine cytology still continued. [2] Hence International Academy of cytology congress was held in Paris in May 2013 and conceived The Paris system (TPS) of reporting urinary cytology to produce uniformity in reporting Urinary cytology which was later updated and published in November 2015.[6]

We have been reporting urine cytology in our institution by conventional method. We intend to adopt this standard reporting in our laboratory.

This study was conducted to assess the utility of urine cytology reporting as per The Paris System to evaluate its performance in diagnosing urinary neoplasm.

METHODS

This was a cross-sectional study conducted in the Department of Pathology, Birat Medical Teaching Hospital, Morang over a 12-month period (September 2022 to August 2023). The approval of the study was taken from the Institutional Review Committee (Ref: IRC-PA-220/2022). Written informed consent was taken from all the patients. All patients presenting to the department of pathology for urinary cytology for a period of 12 months from September 01 2022 to August 31, 2023 was evaluated. Voided as well as urine post instrumentation was included in the study. Inadequate sample and patient not willing to take part in the study were excluded from the study.

Total enumeration sampling technique was used. A total of 57 patients presented to department of pathology to perform urine cytology in a period of 12 months. Early morning second sample was taken. Samples were centrifuged in a Digilab centrifuge machine at 3000 rpm for 10 minutes and then smears was prepared from the sediment. Two smears was prepared which was stained by May Grunwald Giemsa (MGG) and Papanicolaou stain respectively. Cytology was evaluated as per TPS by two pathologists. Standard algorithm to approach for reporting urinary cytology was followed. The diagnostic categories used for TPS for reporting urinary cytology are [7]

1. Nondiagnostic/unsatisfactory
2. Negative for high-grade urothelial carcinoma
3. Atypical urothelial cells (AUC)
4. Suspicious of high grade urothelial carcinoma (SHGUS)
5. High grade urothelial carcinoma (HGUS)
6. Low grade urothelial neoplasm (LGUC)

7. Other: Primary and secondary malignancies and miscellaneous

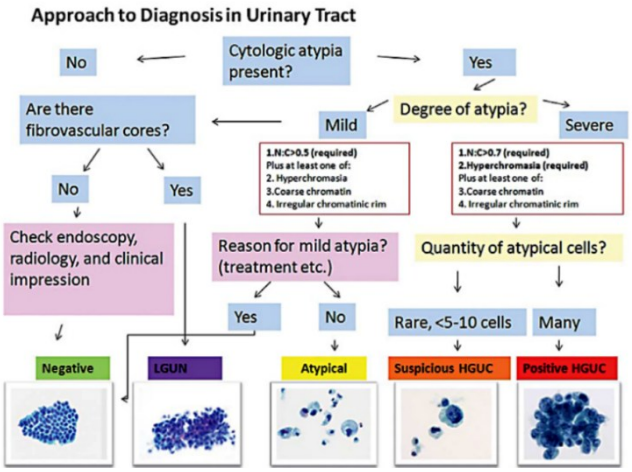

Figure1: Cytological criteria and approach to diagnostic categories of the Paris System [7]

Whenever available histopathological samples received was fixed in formalin, processed and subsequently stained by Hematoxylin and eosin. The findings of histopathology was assessed and correlated with the cytological findings. Histopathological diagnosis was taken as the gold standard for evaluation of cytological findings. Findings was recorded. Data was entered into Microsoft Excel and analyzed using SPSS Version 23.

RESULTS

A total of 57 patients underwent urine for cytology during the period of one year. The age of the patients ranged from 35-85years with mean of 61.77±12.07 years. Majority of the patients were males (82.46%). Most of the patients were diagnosed as negative for HGUC (70.17%). HGUC were diagnosed in 7.02% patients only. (Figure2)

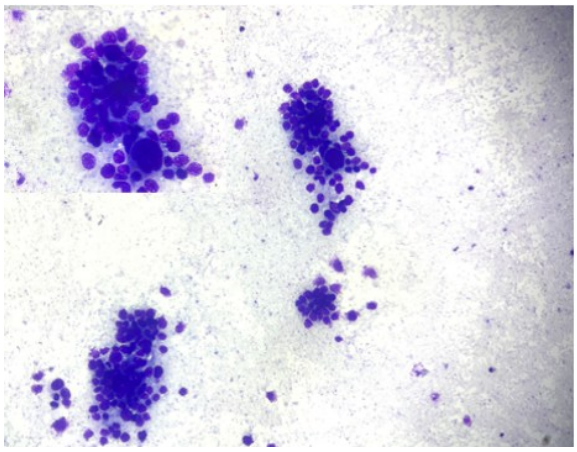

Figure 2: Cytomorphology of HGUC. (Giemsa stain 100x)

Table 1: Frequency of The Paris System Cytological Diagnostic Category (n=57)

Category	Frequency (%)
Non-Diagnostic/unsatisfactory	0 (0)
Negative for HGUC	40 (70.17)
AUC	4 (7.02)
SHGUC	4 (7.02)
LGUC	5 (8.77)
HGUC	4 (7.02)
Total	57 (100)

AUC; Atypical Urothelial Cells, SHGUC; Suspicious for High Grade Urothelial Carcinoma, LGUC; Low Grade Urothelial Carcinoma, HGUC; High Grade Urothelial Carcinoma

Biopsy samples were received in 26 patients where 12 patients had benign urothelial lesions, 5 patients had low grade urothelial carcinoma and 9 patients had high grade urothelial carcinoma. Out of nine patients reported as negative for HGUC, one showed LGUC in biopsy. On histology five patients showed follicular cystitis, two patients had acute on chronic cystitis and one patient had granulomatous cystitis. (Figure 3) In eight urine samples reported as HGUC and SHGUC, biopsy

was received in all samples where all these showed HGUC. (Figure 4) (Table 2)

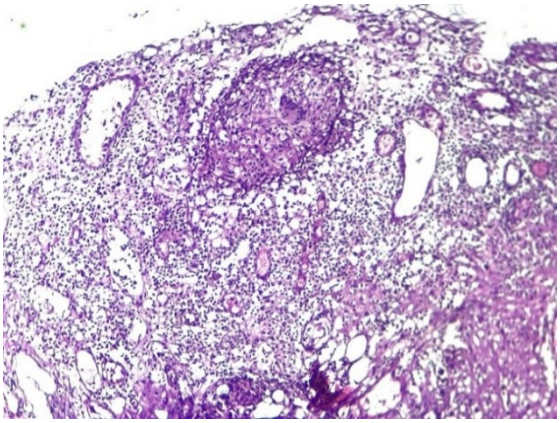

Figure 3: Histopathology of granulomatous cystitis (Hematoxylin stain, 100x)

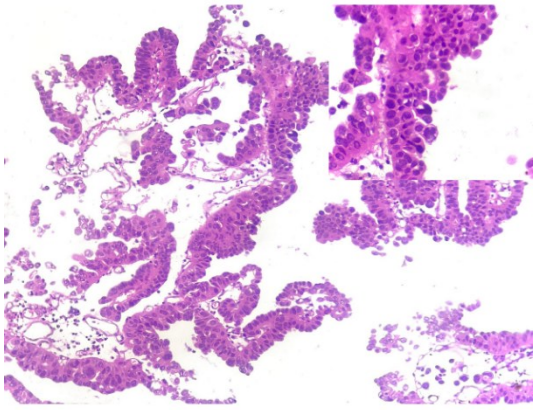

Figure 4: Histopathology of HGUC (Hematoxylin stain, 100x insight 400x)

Table 2: Biopsy finding in relation to urine cytology category. (n=26)

Biopsy findings	Cytological diagnosis (TPS category)						
	ND	NHGUC	AUC	SHGUC	LGUC	HGUC	Total
Benign urothelial	0	8	3	0	1	0	12
LGUC	0	1	0	0	4	0	5
HGUC	0	0	1	4	0	4	9
Total	0	9	4	4	5	4	26

AUC; Atypical Urothelial Cells, SHGUC; Suspicious for High Grade Urothelial Carcinoma, LGUC; Low Grade Urothelial Carcinoma, HGUC; High Grade Urothelial Carcinoma

The sensitivity, specificity, positive predictive value and negative predictive value for detecting high grade lesions were 88.9%, 100%, 100% and 94.4% respectively. Similarly, sensitivity, specificity, positive predictive value and negative predictive value for detecting low grade lesions were 80%, 95.2%, 80% and 95.2% respectively.

DISCUSSION

Clinicians usually depend upon urine cytology not only for screening new cases of malignancy especially HGUC but also for surveillance and follow up for determining further management of the patient. [9] It helps to prevent unnecessary invasive diagnostic modalities like cystoscopy or biopsy. Introduction to TPS has led to standardized reporting of urine cytology. [10] In our context urine cytology is still based on conventional method, which has led to lack of uniformity and inter observer variability. A standardized reporting system would be helpful. Thus we evaluated 57 patients urine sample, reported it using TPS diagnostic categories and correlated it with biopsy samples wherever possible.

In the present study there is male predominance. Similar results were seen in others studies as well [8,10] As the incidence of bladder cancer is four fold higher in males compared to females, the frequency of urine cytology in males might have outnumbered.[11]

Our study showed no non-diagnostic category compared to 1.92% in study done in urban area of Nepal. [8] This might be due to the exclusion of inadequate samples in our study. As per TPS, most of the patients were diagnosed as negative for HGUC (70.17%). Similar finding were seen in the others studies as well. [8,9] However, reporting rate was only 50% in study by Malviya et al.[6]

The frequency of AUC in the present study is 7.02%. Rate of reporting AUC by TPS is 5.1%.[6] Similar results was seen in other studies with similar sample size. [8] This frequency was very low as compared to the other studies. [12,13] Less number of sample size of the present study and adherence to the strict criteria of TPS might be the reason.

In our study 8.77% was reported as LGUC. Contrary to this other studies reported 3.84% to 5.6% while few studies reported none. [8,13,14] In the present study 7.02% was reported as HGUC and SHGUC each. In study done in one of the cancer centers reported 2.7% of HGUC and SHGUC each. [12] However studies done in India showed higher frequency of HGUC up to 35%. [13–15] This may be due to fact that these studies were done in higher referral centers.

In the present study biopsy sample was received in 26 patients (45.61%). Follicular cystitis was seen in five patients, two patients showed acute on chronic cystitis and one patient had granulomatous cystitis. Papillary urothelial neoplasm of low grade malignant potential was seen in one patient that was reported as LGUC in urine cytology. The papillary fragments might have led to the false positive LGUC reporting. Hence it highlights the importance of nuclear features for correct diagnosis. Similarly out of five LGUC, one turned out to be polypoidal cystitis. All samples reported as HGUC and SHGUC showed HGUC in biopsy. This showed higher diagnostic accuracy of HGUC. One case was reported as AUC, which turned out to be HGUC in biopsy. On reviewing the slides, it was paucicellular with presence of occasional atypical looking cells only. Hence in such cases, close follow up with repeat test is mandatory especially in high risk patients. In other studies sensitivity and specificity of urine cytology ranged from 20 to 97.3% and 74 to 99.5%. [15–17]

In the present study sensitivity, specificity, positive predictive value and negative predictive value for detecting high grade lesions were 88.9%, 100%, 100% and 94.4% respectively. Similarly sensitivity, specificity, positive predictive value and negative predictive value for detecting low grade lesions were 80%, 95.2%, 80% and 95.2% respectively. Thus TPS reporting system performs well to detect high grade lesions and reasonably well for low grade lesions. However studies have shown that TPS is not designed to detect LGUC and its detection failure is not false negative as it is kept under negative for HGUC. [6] Areas of improvements

has to be done in reporting AUS and also consideration of repeat testing in high risk patients. To be highlighted that there are however certain instances where cytology ranks superior to biopsy especially in diagnosing flat lesions, carcinoma in-situ or lesions of upper urinary tract that may not be viewed by cystoscopy. [17,18]

CONCLUSIONS

The standardized TPS system has high sensitivity, specificity, positive predictive value and negative predictive value in diagnosing urothelial malignancy especially HGUC. Thus, we recommend to implement this TPS system in our urine cytology reporting.

CONFLICT OF INTEREST

None

SOURCES OF FUNDING

None

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