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REVIEW

The Paris System for Reporting Urinary Cytology: the quest to develop a standardized terminology

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The main purpose of urine cytology is to detect high-grade urothelial carcinoma (HGUC). With this principle in mind, The Paris System (TPS) Working Group, composed of cytopathologists, surgical pathologists, and urologists, has proposed and published a standardized reporting system that includes specific diagnostic categories and cytomorphologic criteria for the reliable diagnosis of HGUC. This paper outlines the essential elements of TPS and the process that led to the formation and rationale of the reporting system.

The Paris System Working Group, organized at the 2013 International Congress of Cytology, conceived a standardized platform on which to base cytologic interpretation of urine samples. The widespread dissemination of this approach to cytologic examination and reporting of urologic samples and the scheme's universal acceptance by pathologists and urologists is critical for its success. For urologists, understanding the diagnostic criteria, their clinical implications, and the limitations of TPS is essential if they are to utilize urine cytology and noninvasive ancillary tests in a thoughtful and practical manner. This is the first international/inclusive attempt at standardizing urinary cytology. The success of TPS will depend on the pathology and urology communities working collectively to improve this seminal paradigm shift, and optimize the impact on patient care.

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Introduction

More than five decades ago, Dr. George Papanicolaou hypothesized that microscopic evaluation of exfoliated cells in the urine was a potentially useful method to detect urinary tract malignancies. Since then, urinary tract cytology has been plagued by less than stellar literature that showed problems with sensitivity, accuracy, and reproducibility. Particularly troublesome is the low sensitivity in detecting low-grade noninvasive lesions,[1] as well as the lack of standardized diagnostic criteria and wide interobserver variability.

Urine cytology samples constitute a variable, but significant, percentage of daily nongynecologic case volume in any cytopathology practice, and continue to be one of the more difficult specimens that pathologists encounter. Problems include inadequate cellularity of samples, cellular degeneration prior to fixation, as well as unrealistic expectations for diagnosing low-grade urothelial neoplasms (LGUN) by cytology. LGUNs are the most prevalent neoplasms that urologists encounter and are, for the most part, readily visualized via cystoscopy. Additionally, a standardized/comprehensive reporting system for urinary cytology has been missing that is based on the current understanding of the pathogenesis of urothelial carcinoma (UC), and the clinical significance of various types of urinary tract neoplastic lesions. Over 10 years ago, there was an attempt to create such reporting guidelines.[2] The lack of widespread input of the cytopathology community most certainly explains why it has never been generally implemented. In recognition of the need to correct this situation, an international panel of cytopathologists and an urologist with interest in urinary tract cytology convened in Paris in May 2013 at the 18th International Congress of Cytology organized by the International Academy of Cytology. The goal was to discuss ways to improve the reporting and performance of urinary cytology. The value of ancillary tests in the screening and diagnosis of urinary neoplasms was also included for consideration. The original group that met in Paris included cytopathologists (Drs. Dorothy L. Rosenthal, Eva M. Wojcik, Güliz A. Barkan, Lukas Bubendorf, Rana S. Hoda, Ritu Nayar, Stefan E. Pambuccian, Eric Piaton, Momin T. Siddiqui, Margareta Strojan-Fležar, and Philippe Vielh) and a urologist (Dr. Marcus L. Quek).

Pathogenetic bases of The Paris System for Reporting Urinary Cytology

According to current scientific data, UC is divided into two major groups, low-grade and high-grade, based on two separate pathogenetic pathways and biologic behavior.[3-5] Approximately 70% of bladder UCs are non−muscle-invasive (TA/T1), papillary tumors that are usually morphologically categorized as low-grade urothelial carcinoma (LGUC). They have a good prognosis, but may be associated with recurrence and "progression" to high-grade urothelial carcinoma (HGUC) in approximately 10% to 15% of cases. The remaining 30% are muscle-invasive (≥T2) tumors, which are histologically categorized as high-grade and are associated with worse overall survival than LGUC. The most common molecular alteration in low-grade noninvasive tumors is an activating mutation of fibroblast growth factor receptor 3 (FGFR3). This mutation is associated with overall favorable disease characteristics.[6] On the other hand, muscle-invasive tumors show a wide range of genomic alterations, with the most commonly seen deletion or mutation of p53 occurring in about 70% of those tumors. There is a significant body of literature that combines gene expression analysis, whole genome array, comparative genomic hybridization, analysis and mutational analysis of FGFR3, PIK3CA, KRAS, NRAS, TP53, CDKN2A, and TSC1, with resultant identification of 2 separate neoplastic pathways with 2 intrinsic molecular signatures.[4] This genetic evidence has led to the provocative question of whether these are two separate diseases—one, LGUC, associated with an overall good prognosis, and the other, HGUC, associated with a mortality rate of approximately 60%. Therefore, the conclusion of the first meeting of the Paris System Working Group was that the new reporting system would concentrate primarily on the detection of HGUC while minimizing the detection of LGUC, since cytology has a high sensitivity of detecting the former with a poor sensitivity for the latter. This new paradigm became the guiding principle of The Paris System for Reporting Urinary Cytology (TPS).

Standardization of the reporting system

Anatomic pathologists serve as consultants to their clinical colleagues and patients, and pathology reports officially document this communication. To help clinicians choose the optimal management options for the patient, reports must accurately and clearly communicate the cytopathologic findings and outcome probability.

Pathologists actively use the terms "suspicious", "indeterminate", or "atypical"—all too often with resultant failure to provide a clear diagnostic and therapeutic path for clinicians. A survey of pathologists and clinicians performed by Redman et al[7] documented the need for a more standardized terminology for reporting cytopathology results (thyroid fine-needle aspirates [FNAs]) and for the education of clinicians on that terminology. Although pathologists have paid attention to all elements of the pathology report (tumor staging summaries, etc[8]), they have not focused on the issue of report comprehension. In a study looking at surgical pathology reports, surgeons misunderstood pathologists' reports 30% of the time.[9] One of the issues shared by patients and their advocates on Web sites dedicated to cancer advocacy is that different pathologists and/or different institutions use different highly technical terms to describe the same entities, predictably confusing to both patients and their clinicians.