UDC: 616.63-074/-076
Professional paper

CORRELATION BETWEEN BIOCHEMICAL ANALYSIS AND THE CYTOLOGY OF URINE SEDIMENT SMEARS STAINED BY GIEMSA METHODS

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Abstract

Objective: Urine is a body fluid consisting of approximately 95% water and approximately 5% of urea, creatinine, uric acid, phosphate, and other compounds. Urine and urine tests are the main biomarkers of urinary tract infections. It is widely used for the diagnosis of a range of health conditions in an individual or group. Despite many attempts to develop another test with greater sensitivity and specificity, cytology remains one of the best (i.e., inexpensive, quick, and reliable) ways to diagnose a variety of bladder lesions, most importantly high-grade urothelial cancer.
Material and Methods: We evaluated voided urine collection (50 ml) from 320 urine samples patients. After collection, a 20 ml of each urine samples were submitted to biochemical chemometric analysis using an automated analytical spectrophotometric equipment Urine analysis were performed by collecting urine in sterile cups and using the urine microscopy method and urine strip test using the chromatographic method, where these analyzes were performed according to the European standards manual. From each patient was extracted a 30 ml urine which was centrifuged and then stained with Giemsa method. The cytological findings were classified using the
Paris system for reporting urine cytology.
Results: The mean age of total patient analyzed was 20-85 years, where the number of male patients was 15 and female patients 25. Pregnant patients were excluded from this study. After collecting the biochemical and cytological results we found that the large number of patients had inflammatory changes in cytology which were
confirmed with biochemical analysis. From a total of 20 smears we did not find any atypical urothelial cell in the smears.
Discussion: In the study, urine sediment cytology was easily performed and showed a good overall accuracy. The agreement with urinary biochemical analysis was good.

Keywords: urine, cytology, biochemical analysis.

Introduction

Urine is a body fluid consisting of approximately 95% water and approximately 5% of urea, creatinine, uric acid, phosphate, and other compounds. It is widely used for the diagnosis of a range of health conditions in an individual or group. Despite many attempts to develop another test with greater sensitivity and specificity, cytology remains one of the best (i.E., Inexpensive, quick, and reliable) ways to diagnose a variety of bladder lesions, most importantly high-grade urothelial cancer.
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Although adequacy criteria have been established in some areas of cytopathology to prevent false-negative diagnoses, controversy has persisted in urinary tract cytology. Accepting an inadequate sample as adequate for interpretation is one of the most common causes of diagnostic discrepancies when two pathologists interpret the same cytology specimen. The overestimation of cellular or volume adequacy is also recognized as a source of error and a reason for (1) failure to detect a lesion due to an inadequate but accepted sample or for (2) overinterpreting cellular degeneration artifact as

representing a significant lesion.

Material and methods

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Results

The mean age of total patient analyzed was 20-85 years, where the number of male patients was 15 and female patients 25 .Pregnant patients were excluded from this study. After collecting the biochemical and cytological results we found that the large number of patients had inflammatory changes in cytology which were confirmed with biochemical analysis. From a total of 20 smears we did not find any atypical urothelial cell in the smears.

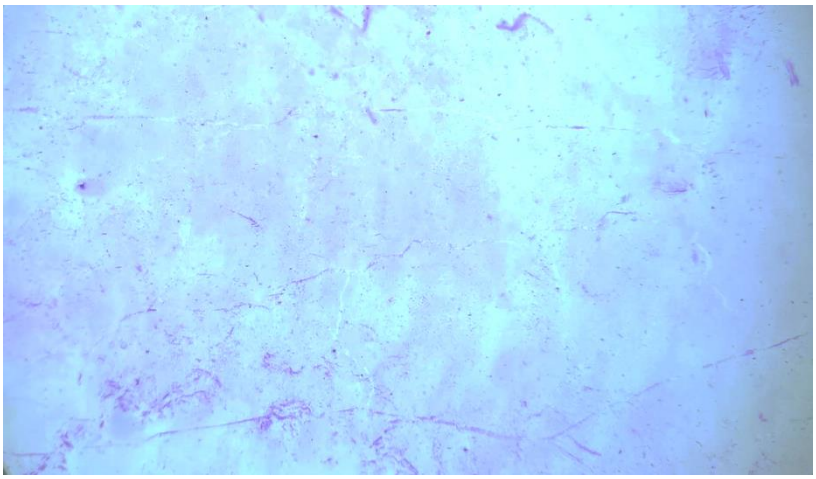

Figure 1. Micrography from urine sediment—a cytological specimen from voided urine, Giemsa staining x40 (Unsatisfactory/nondiagnostic specimen. Acellular specimen showing only lubricant without the presence of urothelial cell)

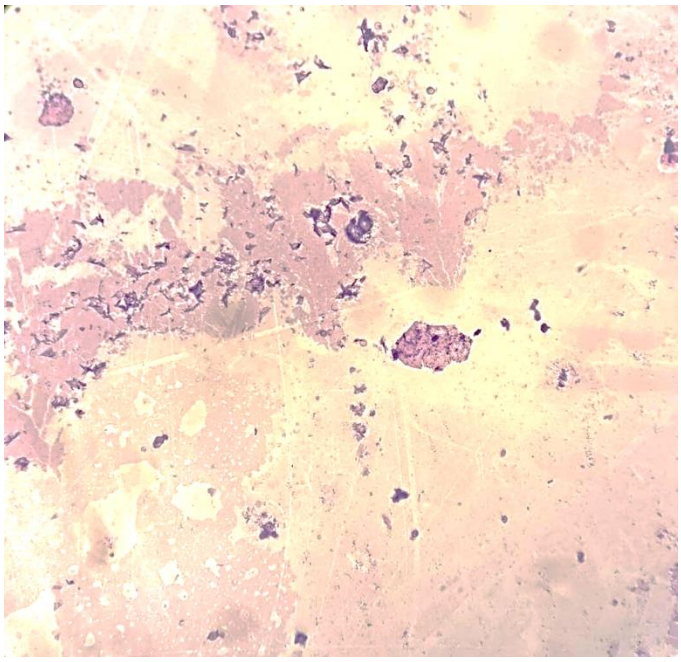

Figure 2. Scantly cellular specimen from voided urine with (voided urine, single mature squamous cell, x40, Giemsa stain)

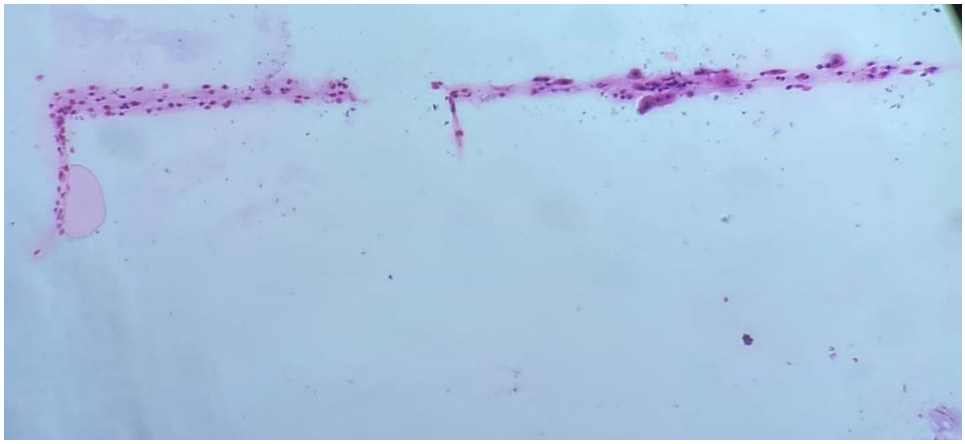

Figure 3. Scantly cellular specimen from voided urine with (voided urine, mature squamous and urothelial cell, x40, Giemsa stain

Disscusion

Fresh urine sediments were carefully examined, allowing for the identification of various cellular types linked to various diseases. The inflammatory alterations were usually linked to nephrolithiasis and urinary tract infections. The inflammatory cells had thick nuclear membranes, clear chromatin patches, clusters of heterochromatin, and nuclei with asymmetric chromocenters. Following is a summary of the major findings in the fresh urine sediments of this study:

A. With the exception of the Polyomavirus infection, where cells have a high N/C ratio and the nuclei present a "empty" aspect with clumps of chromatin on their membranes, cells from benign pathologies show a conserved N/C ratio according to the layer of the urothelium in which they originate.

B. Low-grade urothelial tumors have compact cellular groups arranged in bi-dimensional or papillary fashion, a high nucleolar to chromatin ratio, powdery chromatin, and clear nucleoli.

C. The isolated cells in high-grade urothelial malignancies are primarily anisokaryotic, exhibit multinucleation, have a high N/C ratio, and have odd morphologies.

D. Tadpole cells with a high refringence, spindle-like cells, and squamous pearls are features of the keratinizing squamous carcinoma.

E. Compact and three-dimensional growths are characteristics of vesical adenocarcinoma. Vesical adenocarcinoma is distinguished by megakaryosis, a high N/C ratio, and conspicuous vacuolization in compact, three-dimensional cellular groupings.

We can draw the conclusion that this study shows a strong association between cytological analysis of urine specimens in fresh smears and in Papanicolaou-stained smears. In order to distinguish between non-tumorous and tumoral diseases, it is crucial to identify urinary tract cells in samples seen in fresh sediments. This diagnosis is then confirmed using the Papanicolaou method. The following stage will involve educating experts and technicians about these disorders and informing the urologists and nephrologists in our local hospitals of the study's findings. This article's methodological proposal tries to establish an early cytodiagnosis, which could reduce the morbidity and mortality linked to this type of pathology.

In the study, urine sediment cytology was easily performed and showed a good overall accuracy. The agreement with urinary biochemical analysis was good.

Conclusions

Urinary tract sample analysis is the consequence of the complex interaction of many different factors; at the time of pathologist sign-out, these factors condense into four specific observables: collection type, cellularity, volume, and cytomorphological findings. While the laboratory must validate standard operating procedures to ensure the greatest degree of diagnostic uniformity, some pre-analytical variables are now too challenging to standardize. However, in the field of urine cytology, the only commonly processed cytological specimen obtained without a medical expert present when the specimen exits the body is voiding pee.

Funding: We did not receive any funding for any of the manuscript’s writing and preparation phases. All authors declare no conflicts of interest.

References

[1]. Weinstein RS, Coon JS, Schwartz D, Miller AW 3rd, Pauli BU. Pathology of superficial bladder cancer with emphasis on carcinoma in situ. Urology 1985;26:2-10.

[2]. Poulakis V, Witzsch U, De Vries R, Altmannsberger HM, Manyak MJ, Becht E. A comparison of urinary nuclear matrix protein-22 and bladder tumour antigen tests with voided urinary cytology in detecting and following bladder cancer: The prognostic value of false-positive results. BJU Int. 2001;88:692-701.

[3]. Placer J, Espinet B, Salido M, Sole F, Gelabert-Mas A. Correlation between histologic findings and cytogenetic abnormalities in bladder carcinoma: A FISH study. Urology 2005;65:913-8.

[4]. Carson, FL, Hladik,Ch. Histotechnology: A Self-Instructional Text 3rd ed. Hong Kong: American Society for Clinical Pathology Press; 2009. p. 361-3.

[5]. Cohen JC. Statistical Power Analysis for the Behavioral Sciences, 2nd ed. Hillsdale, NJ: Lawrence Erlbaum; 1988. p. 133-47.

[6]. Polo C, Perez JL, Mielnichuck A, Fedele CG, Niubo J, Tenorio A. Prevalence and patterns of polyomavirus urinary excretion in immunocompetent adults and children. Clin Microbiol Infect 2004;10:640-4.

[7]. Fuller T. The historie of the holy warre. Cambridge: Thomas Buck; 1639.

[8]. Hörl WH. The medicinal use of urine. Am J Nephrol. 1999;19:111–3.

[9]. Savica V, Calo LA, Santoro D, Monardo P, Mallamace A, Bellinghieri G. Urine therapy through the centuries. J Nephrol. 2011;24(Suppl 17):S123–5.

[10]. Harris WV. Scatological Asklepios: the use of excrement in Graeco-Roman Healthcare1. J Hist Med Allied Sci. 2019.

[11]. Kiefer JH. Uroscopy: the artist's portrayal of the physician. Bull N Y Acad Med. 1964;40:759–66.

[12]. Friedlaender GE, Friedlaender LK. Saints Cosmas and Damian: patron saints of medicine. Clin Orthop Relat Res. 2016;474:1765–9.

[13]. Morgagni G. De sedibus et causis morborum; The Seats and Causes of Diseases, 1761, Translation, Alexander B., 1768, Classics of Medicine Library, 1983, Gryphon Editions, Birmingham Alabama.

[14]. Diamandopoulos AA, Goudas PC. The late Greco-Roman and Byzantine contribution to the evolution of laboratory examinations of bodily excrement. Part 1: urine, sperm, menses and stools. Clin Chem Lab Med. 2003;41:963–9.
[15]. Diamandopoulos AA, Goudas PC. The late Greco-Roman and Byzantine contribution towards the evolution of laboratory examinations of bodily excrement. Part 2: sputum, vomit, blood, sweat, autopsies. Clin Chem Lab Med. 2005;43:90–6.
[16]. Eknoyan G. Beginnings-the kidney and nephrology in ancient mesopotamian culture. Semin Dial. 2016;29:236–46.