

Urine Sediment Examination: A Perspective of Samples with Significant Pathology in the Sediment from a Tertiary Care Nephrourology Referral Centre from South India

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Abstract

Urine analysis is used as a diagnostic method is lauded by many a nephrologists through the ages as equivalent to a liquid biopsy. The urine sample is easy to procure and is a physiological process and pain less. It has a wide and varied use as a diagnostic tool as in follow up, confirmation of diagnosis and screening measures. The question of the hour is do automated machines find themselves in the bracket of adequateness do they do justice for all the elements present in a pathological urine specimen. For example spermatozoa, trichomonas, schistosomiasis, ectoparasites however the WBCs and RBCs can be reported in a qualitative manner which compare well and unequivocal without much ado but is it all!

Keywords: Urine; Nephro-urology; Trichomonas

Objective

To present a review of literature with the advent of automation and the authors' personal experience and perspective of a manual sediment examination of urine with respect to pathological specimens more so nephrology related when compared to automated results. The later as we all know is less labor intensive, less manual interference and its heterogeneity is well known.

Introduction

Evidence based medicine is the key component to clinical practice and turnaround time then becomes an important factor for onset of treatment. This later point requires the treating physician's decision making not only on personal intellectual property but also with very precise quality of scientific evidence. New scientific data is emerging all the time and there is an enormous amount of literature the health personals have to go through to keep abreast. Most busy practitioners are starved for time, for e.g. PubMed has recorded 22 million citations in its various published journals in the year 2013-2014 so that gives us a bird's eye view of the academic volume. Even when one restricts oneself to high yield journals of one's interest it is still not negotiable truth that they do not tap on all doors. This is when the treating clinician needs a dependable system of knowledge management and in other words collective wisdom of all the material published and their conclusions where in comes the role of review articles. The single most essential part of the system would be to apprise the said literature available and compile it to a valuable knowledge giving or a vehicle to percolate knowledge as an over view or review through persons of reasonable expertise in the said field or specific interest in the said field [1,2]. The author of this article is a senior pathologist of nearly two decades in the subject of pathology and currently her department sees an annual sample load of 5000-6000 urine routine samples processed by a team of technologists with a single pathologist at a regional referral tertiary care institute. The author has reviewed the articles of high output studies or high quality studies regarding specific indication, outcomes of automated and manual examination of urine sediments in question. Automated systems for particle testing was introduced and published in 1986 which concludes saying that in pathological urine specimens for e.g. urine with + protein needs to go through manual microscopy to eliminate errors whereby there is compromise of patient treatment [3,4]. Automated systems of urine chemistry and urine sediment analysers state that the appearance of review flags

due to suspected sediment abnormalities or system or sample related errors require manual sediment reviews. Automated flow cytometry compared with an automated dipstick reader for urine analysis the uf-100 is not a substitute for microscopic sediment exam though can act as a surrogate test. The automated systems are still inadequate to classify the cells that are present in pathological urine specimens [5,6]. Dipstick testing combined with computer assisted automated testing may lead to clinically acceptable urine analysis but is not a substitute for manual sediment examination [7] there is a range of 13%-15% which would be false negative now to conclude as to how important it would be dependent on the patient population [8].

Higher count does not mean greater precision but it actually means examination of larger volume.

Literature Search

Standardized high index reader journals were selected, authors of credence in the subject concerned were looked at through their publication personal interactions with clinicians dealing with concerned patient population were asked for opinion/consensus totally 40 Journals were tracked and about 24 met inclusion criteria, which was those which belonged to research topic per say that is automation in urine analysis their results and comparisons of automated with manual methods when connected to patients with pathological findings in urine [9]. They were by reference tracking, 8 no's by having listened to clinics in urine or by personal interaction with one of the authors by the review article writer, the rest were by cross references of the journals which covered the subject we are reviewing.

Heterogeneity was paid importance in order to get a truly unbiased inference; each publication detailed prints were made of the

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Received: July 24, 2014; Accepted: May 19, 2015; Published: May 25, 2015

Citation: Siddappa S (2015) Urine Sediment Examination: A Perspective of Samples with Significant Pathology in the Sediment from a Tertiary Care Nephrourology Referral Centre from South India. J Nephrol Ther 5: 203. doi:10.4172/2161-0959.1000203

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Author	Search Module /Journal	Instrument	Conclusions
1. Shishenkov M, et al. [8]	Current general and microscopic urine analysis in the routine (clinical laboratory) practice in Bulgaria-tarakia Journal of sciences vol.11.no 4.2013	H 800/FUS100, H300/FUS 100	Is less labor intensive, increases productivity, increases technical expertise, he should be in position to verify controls, confirm the automatic findings, LAB can be run on Lean a Principles of Management Contributes to greater reliability of staff, well recommended
2. J Toffaletti et al. [7]	Comparison of 2 automated systems for urine chemistry and urine sediment analysis Laboratory and hematology 5:1-xx 1999	IRIS 900 Udx Sysmex uf-100	The arbitration of these instruments with manual microscopy favored each instrument nearly the same, there for the authors agree that both the concerned instruments are nearly the same and are substantially reliable and therefore could be used clinically.
3. Michel R Langlois, et al. [5]	Clinical Chemistry Jan 1999 vol.45 no .1 118-122 automated flow cytometry compared to an automated dip stick reader for urine analysis	Sysmex UF-100	In conclusion dip stick testing combined with computer assisted UF-100 sieving system may lead to an clinically acceptable urine analysis, UF-100 analyzer is not a substitute for microscopic sediment examination
4. Yuksel H et al. [12]	Journal of clinical lab analysis. Jul 2013 27(4):312-6. Comparison of fully automated urine sediment analyzers H800-FUS 100 AND Lab Umat-Uri Sed with manual microscopy.	Lab UMat-Uri Sed, H800-FUS 100 with manual microscopy,	The two devices showed similar performances, they were time saving in the form of standardized technique, especially for reducing pre analytical errors such as study time, centrifugation and specimen volume for sedimentary analysis, however the automated systems are still inadequate for classifying cells that are present in pathological urinary specimens
5. Delanghe JR et al. [13]	The role of automated urine particle flow cytometry in clinical practice clinical chemistry acta 2000 Nov:301(1-2):1-18	UF-100 sysemax Japan	The popular approach would be to combine test strips with UFC A for primary screening, it states that expert system now exists combining both test modalities based on user definable decision rules
6. Chien TI et al. [14]	Urine sediment examination: a comparison of automated urine analysis system and manual microscopy journal of clinical chemistry acta 2007 Sep: 384 (1-2):28-34.Epub 2007 may 26.	Sysmex UF-100 IRIS IQ 200 Manual Microscopy	The 2 automated instruments demonstrated Good Concordance with Each Other in Urine Sediment Examination .The automated process could be used as a screening procedure but some manual microscopy will be necessary
7. Ito K et al. [15]	Automated analysis on urine formed element by using FCM article in Japanese Rinsho Byori 2001 Sept :49(9):847-52	FCM Japanes Tecnology	At the moment detailed examination of epithelial cells and casts are difficult on these fundamental tests till an improved analytical algorithm and staining technology is in place
8. Wah DT et al. [3]	Analytical performance of the iQ 200 Automated Urine M microscopy Analyzer and Comparison With Manual count s using Fuchs – Rosenthal's Cells Chambers 2005 American Journal of clinical pathology 123,290-296	Iris iQ200 iris diagnostics, (Chatsworth, CA) Manual method using Fuchs – Rosenthal's chambers	Their final recommendation of the manufacture manual review of stored images is that all casts, Wbc clumps, yeasts should be verified by

9. Van den Broek D et al. [16]	Benefits of the iQ200 Automated urine microscopy analyzer in routine urine analysis clinical chemistry and laboratory medicine 2008;46(11):1635-40	IQ200 with routine manual urine analysis	The identification of dysmorphic erythrocytes and casts is consistent, the sub classification of casts require well trained technicians .The automated instruments -classification of particles was least reliable for yeasts and bacterial cocci
10. Fogazzi GB et al. [17-20]	Automation verses manual The urinary sediment. An integrated view	3 automated systems with manual sediment analysis	Automated systems had their deficiency with respect to reference, a, the difference in manual methodology was from person to person but classification and equal technical experience will play a role in uniformity of reporting
11. Secchiero S, Fogazzi GB, et al. [21]	(EQUAS)For the urinary sediment an Italian experience crb 2007	In 6 years 72 images, 144 photographs and each of the same elements to the same laboratory twice were compared	Limitation one picture with a single element which is not a standard protocol followed for routine examination the current technique was useful in continual improvement of urinary sediment exam Quality
12. Giovanni B Fogazzi, Simon Verdesca and Giuseppe Garigali [22]	Urine analysis : Core Curriculum 2008	Automated analysis of urine sediment of both techniques involving image analysis using digital software and flow cytometry technology using scatter grams and numeric data, both these instrument have been flagging acceptable results for Rbcs, squamous epithelial cells, some variants of crystals and casts, bacteria and yeast cells, sperms, however they do not recognize particles of nephrological importance such as eg far too many false negative casts	These fully automated machines can be used in laboratories to screen large numbers of mostly normal samples for a short period of time .in the others opinion this approach is not adequate for renal patients for whom manual microscopy combined with motivated well educated examiner represents the gold standards
13. Tsai JJ et al. [23]	Comparison and interpretation of urine analysis performed by a nephrologist versus a hospital –based clinical laboratory American journal of kidney diseases 2005 Nov ;46(46):820-9	Microscopy difference by laboratory technicians and urine microscopy reading nephrologists	Nephrologists made better diagnosis of renal tubular epithelial cells, renal tubular epithelial casts and dysmorphic red blood cells, Epithelial cells, whereas the laboratory may report renal tubular epithelial as squamous epithelial cells in a significant no of cases
14. Rolando clare-del grando, Elienne Macedo, Ravindra [24]	Urine microscopy in acute kidney injury :time to change American journal of kidney disease 2011	Microscopy the nephrologists should take precedence of reporting urines when compared to general laboratory findings	Their conclusions have been suggestions of initiatives in every nephrology programmed, with implements such as multithreaded scopes, should be priority based nieces in a nephrology training programme
15. Simona Verdesca, Claudia Brambilla, Giuseppe Gargali, Maria Daneila Croci, Piergiorgio Messa and Giovanni Battista Fogazzi [25]	How a skilful and motivated urinary sediment examination can save the kidneys Journal of nephrology dialysis and transplantation 2007, 22, 1778, 1781	Dip stick and manual exam in	A urine sediment under the reporting of an unskilled eye will miss pathological casts which go un noticed many a time

Table 1: Brief literature review .

entire article for information which was later used for comparison, heterogeneity looked in for were sample collection procedures, type of patient population, bench turnaround time, year of study, sample size, methodology manual versus, automated where flow cytometry, visual computerized and reference methodologies as in atlases used and their limitation and constraints [10,11]. Manual methodologies, quality check in the form of concurrence were assessed. Country which it was performed in terms of application and feasibility of host environment, all were original articles to get insights on the authors' personal view/experience. All the above mentioned variables are looked into. The actual credibility of the automated instruments would be in their competency to screen urine sample reports of patient population who do not have any diagnostic pathology per say as in a large laboratory of a general hospital where more than 70% of the patients have normal urine reports or in other words non diagnostic pathology (Table 1).

Conclusions

In accordance to the clinical and laboratory standards institute each laboratory should establish a protocol with respect to urine examination based on the patient population, the consulting physicians preferences [24]. Reliable results are dependent on a correctly collected sample, with adequate information dissemination to the patients in their local language where ever possible, with well stipulated bench turnaround time, the last but not the least adequate communication between the clinicians and the laboratory of the same. A lot of work is involved on the final report including cost effectiveness and evidence base use of limited resources as in economics money saved is money earned. To summary again is the methodology one uses can be based on individual preferences, patient population or advantages as many the case be. Manual methodology is most preferred mode to give a good comprehensive report when it comes to patients.

Gratitude

This article is dedicated to our team of technologist who are the back bone of our laboratory.

To my colleague Dr. Kowsalya in fine tuning the article by helping in the formatting,

Acknowledgement

will not be complete without thanking our director Prof. CS Rathkal for his support in our academic endeavours.

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