Chemical analysis of Urinary Calculi using local kit

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Abstract
A better understanding of chemical principles underlying the formation of calculus has led to a need for more precise information on the chemical composition of stones. A qualitative procedure for the chemical analysis of urinary calculi which is suitable for routine use is presented. The procedure involves five simple qualitative tests. These data are used to identify the composition of the stone in terms of calcium oxalate, and ammonium phosphate. We tested and identify the mineral composition of urinary stones by simple diagnostic kit locally invented and approved by vaccine and sera instituted. Our study has been shown to provide exceptionally high quality imaging of the fine structure of urinary calculi.

Introduction
Urinary stones are crystals, mainly of oxalate, and /or phosphate and urate formed in the kidney. Statistical studies showed that men with ages in the range of 20 to 40 have the highest risk. Most stones are formed due to dietary factors, like the intake of high dairy products or salts which would increase the amount of Ca in the urine. Low intake of water would increase the percentages of stones in the urine(Pearle et al 2005,Delveccio et al 2003,Menon et al 2002,Mandel N. 1997,ED Edelson). Genetic effects, intake of vitamin C may play also a roll in the formations of stones. Pain in the lower back below the ribs and blood in the urine indicate the presence of stone. Stones - smaller than 5mm- will usually pass through micturation. Clinical laboratory assessment of urinary stones is typically using chemical methods of analysis [Pearle et al 2005,GM,Assimos et al 1997,Chandhoke 2005] and is usually identify stones by their primary mineral content. Stones get classified as having multiple components, and describe the pattern of different minerals in heterogeneous stones. Thus, stones are commonly classified as being calcium oxalate ,calcium phosphate, or a combination of these two mineral crystals called (hypercalciuria), Struvite stones are made up of ammonia, and phosphate and normally result from bacterial urinary infections. The bacteria produce urease, an enzyme that promotes the development of struvite crystals by making the urine alkaline. The most common bacteria associated with struvite stones is Proteus mirablis. Uric acid stones form when there is too much acid in the urine. this type of stone is closely related to diet and most often affects people who consume large quantities of animal protein. Cystine stones are rare, accounting for only about 1 percent of all urinary stones. When this information makes its way to the patient's chart, the individual may be classified simply (GM,Assimos 1997, Lotan et al 2004,Delabella et al 2005). It has been determined that the vast majority of stones actually contain more than one type of mineral [Chandhoke 2002,Qiang et al 2004,Borghi et al 1996]. Knowing the mineral composition of a patient's stones has obvious value in determining a treatment plan(Klee et al 1991,GRASESF ET AL 1990,krambeck et al 2006,Finkielstein et al 2006). The purpose of this study is to present simplified methodology for the analysis of urinary stone composition. In the present study, we observed to providing chemical structure of human urinary stones and differentiate six common mineral constituents by using local urinary calculi analysis kit.

Material and method:
Twenty human urinary stones were received from Al Kadimea Hospital and Al-Wedded Lab were examined at vaccine and sera instituted /research department for the chemical
composition from 1998 to 2000. Analysis for mineral that was positively identified by chemical reagent, using Urinary calculi analysis kit such and such materials Nessler reagent, Saturated ammonium oxalate, ammonium molybdate solution, 0.05N potassium permanganate, 0.1 N sodium carbonate, Phosphotungestic acid, 1N HCL, artificial chemical stone. Human urinary stones were obtained following analysis laboratory. A representative collection of urinary stones of pure and heterogeneous mineral content was selected for use in this study. Compositions of 20 stones used for identification. The analysis on stones were completed using standard artificial stone (artificial stone contain ammonia, Calcium, phosphate, oxalate, uric acid). Wash the stone with water and dry on a filter paper. Note the external appearance (single, multiple, rough, smooth, horned, or waxy). Crush stone about (0.1 gm), then add 5ml of HCL, if babble appear carbonate is positive, centrifuge, then add 0.5 ml of supernated solution in each test tube using (5 test tube).
The Method of analysis is summarized in table (1).

<table>
<thead>
<tr>
<th>Stone composition</th>
<th>Method for identification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ammonia</td>
<td>0.5 ml Nessler reagent</td>
<td>Orange-brown</td>
</tr>
<tr>
<td>2. Calcium</td>
<td>1 ml of Saturated ammonium oxalate</td>
<td>White precipitate</td>
</tr>
<tr>
<td>3. Phosphate</td>
<td>1 ml Ammonium molybdate solution</td>
<td>Yellow precipitate</td>
</tr>
<tr>
<td>4. Oxalate</td>
<td>0.01ml potassium permanganate</td>
<td>colorless</td>
</tr>
<tr>
<td>5. Uric acid</td>
<td>0.5 ml sodium carbonate, 0.5 ml Phosphotungestic acid</td>
<td>Blue color</td>
</tr>
</tbody>
</table>

The results of qualitative analyses are completed with 20 minute after receipt of the specimen. A descriptive report were including a gross description and chemical identification of the stones, result written as category.

. Results:
Urinary stones showed excellent resolution of structural detail that could be correlated with structure of pure mineral artificial, values were collected for six minerals that could be found in that appeared to be pure, including uric acid 10%, struvite 10-15%, calcium oxalate/calcium phosphate 75%.. Analysis of intact stones showed excellent resolution of structural detail and could discriminate multiple mineral types within heterogeneous.

Twenty stone were obtained from alkademia hospital and alweddad laboratory, result show agreement with artificial reference standard.
The same stone analyzed by Iraqi reference laboratory using our kit and it was evaluated and pass analysis and obtain a certificate No 2690 at 2000.

Table (2) chemical composition of the analyzed stones.

<table>
<thead>
<tr>
<th>Chemical Composition of Stones</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium oxalate/Calcium phosphate</td>
<td>75</td>
</tr>
<tr>
<td>ammonium phosphate</td>
<td>10-15</td>
</tr>
<tr>
<td>Uric acid</td>
<td>10</td>
</tr>
<tr>
<td>Mixed calcium, uric acid</td>
<td>5-10%</td>
</tr>
</tbody>
</table>

Discussion:
Chemical kit yield excellent high resolution analysis of stone structure. It is a relatively fast method, taking approximately 20 minute for a complete urinary stone diagnosis. Establishing standards for complete stone analysis was obtained in the present study. A recent study showed that amounts small enough about 0.1 gm can detected. The vast majority of stones contain more than one component [Chandhoke 2002], but many of these mixed stones show obvious separation of the different materials. Chemical analysis kit is a simple reliable
inexpensive diagnostic tool. Mineral content in stones could yield important information useful in determining proper treatment for the patient.

Conclusions:
Analysis of urinary calculi is an essential step in the examination and initial treatment of the patient with kidney stones (urolithiasis). Knowledge of the composition of calculi yields fundamental information concerning the pathogenesis of the disease, including metabolic abnormalities, presence of infection, and even drug metabolism. Our report to the physician notes the weight, size, and shape of stones, the constituents of the stone. Six common stone minerals were found, which allows the identification of mineral types by using local chemical kit for stone analysis, The results of analysis confirm the mineralogic results.

References:
Ed ,Edelson. Kidney stone Shock Wave Treatment Boosts Diabetes, Hypertension Risk- Study suggests link, but doctors say it's too early to abandon this therapy", Health Finder, National Health Information Center.