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FACULTY OF MEDICINE

DISSOLUTION OF URINARY STONES

ESSAY

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BY

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بسم الله الرحمن الرحيم

اقرأ باسم ربك الذي خلق

خلق الإنسان من علق

اقرأ وربك الأكرم الذي علم بالقلم

علم الإنسان ما لم يعلم

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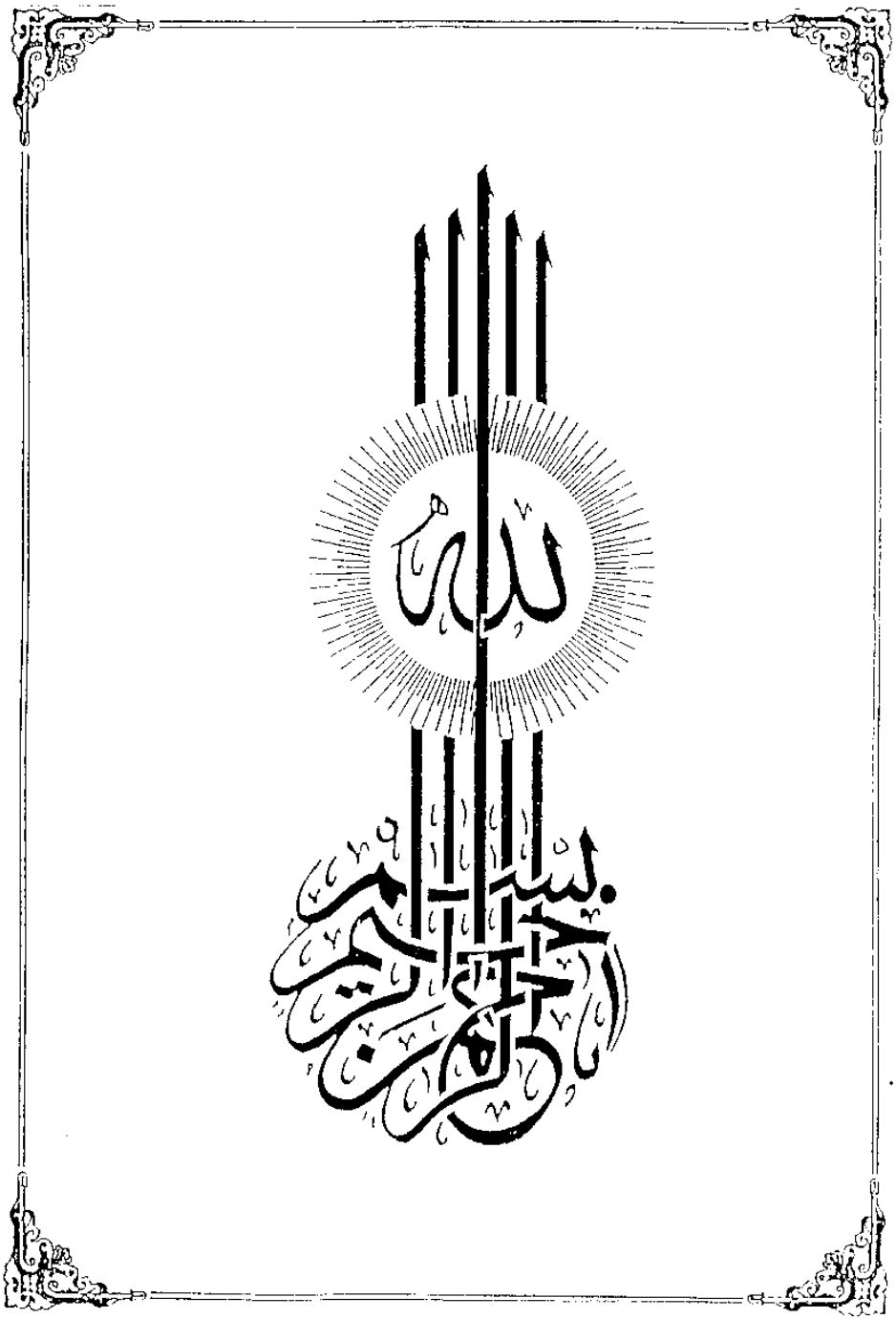

KEY WORDS

E.S.W.L: Extra corporeal shock wave lithotripsy.

I.M. : Intra muscular.

I.V. : Intra venous

P.C.N. : Per cutaneous Nephrostomy.

P.C.N.L.: Per cutaneous Nephrolithotripsy.

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INTRODUCTION

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Chemolysis plays a useful and specific role in the current therapy of urinary stone disease. It was correctly anticipated that the advent of E.S.W.L. and P.C.N.L. would make primary stone dissolution therapy a rarely performed technique. However, what has unexpectedly occured is that chemolysis is increasingly used following E.S.W.L. treatment and surgical management of staghorn calculi (Stephen P. 1986).

An improved explanation of pathophysiology and the formulation of diagnostic criteria for different causes of nephrolithiasis have made feasible the adoption of selective or optimum treatment programs. Such programs should:-

1. Reverse the underlying physic chemical and physiological derangements.
2. Inhibit new stone formation.
3. Overcome non renal complications of the disease process.
4. Be free of serious side effects.

The rational for the selection of certain treatment programs is that the particular physicochemical and physiologic aberrations identified with the given disorder are aetiologically important in the formation of renal stones, and that the correction of these disturbances would prevent further stone formation, Moreover it is assumed that such a selected treatment program would be more effective and safe than a "random" treatment. For many pharmacologic treatment programs recommended for nephrolithiasis sufficient information is now available to characterize their physicochemical and physiologic action (Glenn. M., Preminger 1987).

Although the main subject of this essay is concerned with dissolution of existing stones, Prophylaxis still presents an important item. So, Some details of clinical application will be discussed here about prophylaxis of urolithiasis, and oral chemolytic agents used for each type of stone.

Also the physiologic basis of clinical stone dissolution will be discussed and the appropriate uses, methods, and precautions of administration of chemolytic agents will be outlined.

FORMATION OF URINARY STONES

Urinary stone disease has afflicted mankind since antiquity. The prevalence of stone disease is ten times higher today than it was at the beginning of this century and the incidence is increasing continously (Backman 1985).

In 1983 Burns and Finlayson buplished an article with the provocative title "Why some people have stone disease and other do not".

The "Bottom line" is that while we can define certain broad generalities that are associated with an increased risk of urolithiasis, we cannot predict with pinpoint accuracy why someone will form a stone where as someone else will not (paul H. 1988).

The history of disease implies that many diverse factors might be involved in its causation:

heredity, environment, age, sex, urinary infection, the presence of metabolic diseases and dietary excesses or deficiencies.

Anderson (1973) classified these factors into two separate epidemiologic factors envolved in the genesis of urinary calculi: intrinsic and extrinsic (environmental) factors.

* Intrinsic factors are related to the inherited biochemical or, anatomic or genetic make up of the individual. It includes:-

Heredity: interest in the familial incidence of urinary calculi in relation to the heredity is not new, but Resnick at 1968 concluded that urolithiasis requires a polygenic defect i.e more than one gene is involved. In addition genetic predisposition to urinary lithiasis has partial penetrance, so that the severity of stone disease may differ from generation to generation eventhough the individual has the gene defect necessary for urinary lithiasis (George W. 1976).

Age and sex:

Several authors have pointed out that the maximum incidence of urinary lithiasis occurs beteween the ages 30 to 50 years (Baily et al. 1974 and Fetter 1961). The majority of patients report the onset in the second

decade of life, with decreasing onset through third, fourth and fifth decades (George 1986).

* Extrinsic Factors: it include:-

  - Geography:- There is a noticeable increase in urinary calculi in mountain and tropical areas geography has some influence on the incidence of urinary stones and on the types of stones that occurs within a given area. It seems that geography has an effect in terms of temperature, huemidity, and dietary pattern as concluded by Anderson 1973.

  - Climatic: and seasonal factors: elevated enviromental temperature seems to be definitely related to increased risk of stone disease in population capable of forming stones. High temperature, increases prespiration and increases concentration of urine. This hyperconcentration result in decreased urine volume and increased urinary concentration of molecules as well as excessive urinary acidity (toor et al. 1964). These changes promote crystallization of the respective molecules. This explains increased crystalluria in stone-formers during summer months (Hallson 1977).

@ Water intake: This includes two factors, volume of water ingested and the mineral or trace element content in water . The dilutional effect of water diuresis probably outweighs the changes in ion activity and threfore does help to prevent stone formation: a Urinary out put of 800 to 1200 ml/24h seems to decrease stone formation (Blacklook 1969).

Also mineral content of water may contribute to calculi (Rose and Westbury 1975) while others say that excessive softness (usually sodium bicarbonate)cause increase incidence of stone disease (Juuti and Heironen 1980).

Additionally the presence or absence of certain trace elements in water has been implicated in the formation of urinary calculi for example zinc is an inhibitor of calcium crystallization so low urinary levels of zinc could there fore increase a tendency towards stone formation.

@ Diet: ingestion of excessive amounts of purines or animal proteins has been associated with greater risk of stone formation (paul H. Lee 1988) Obesity has been associated with impaired carbohydrate

tolerance and inappropriate calcium response to glucose ingestion, thus the hypercalciuria seen in meat eaters may be a function of increased body weight. Also increase intestinal calcium absorbtion may be due to exposure to sun light with over production of active vit. D. In addition the diet most important is that of the patient, a careful dietary history is critical to the evaluation of every stone former.

- Occupation:-

Several studies have indicated that upper tract calculi are more common in people with sedentary occupations than in people performing manual labor (Drach G. W. 1986). Occupation also tends to determine exposure to other factors such as high enviromental temperature, which may then increase a tendency toward formation of urinary calculi.

THE THEORETICAL BASIS FOR URINARY STONE FORMATION

Urinary stones are agglomerates of crystals and proteinaceous matter or matrix. In order for stones to form, crystals must form and they must combine with organic matter. Thus theories for the pathogenesis of stone formation must explain why crystals form and how they interact with matrix to become stones.

* Supersaturation:-

The solubility of a substance, is determined by its thermodynamic solubility product (Ksp). This Value is usually measured by adding crystals of the substance in question to pure water at a given temperature and PH. Since urine is a complex polyionic solution the solubility of a substance in Urine may be markedly different from its solubility in water. (Paul H. Lee 1988).

In So for as the crystalline factors that produce urinary stones are concerned, a higher concentration of these substances is soluble in urine than in water.