

The Dietary Regimen in the Treatment of Renal Calculi

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EXPERIMENTAL observations demonstrating the relationship between the formation of renal calculi and a diet deficient in vitamin A have been described by Osborne and Mendel¹, McCarrison², Fujimaki³, Van Leersum⁴, Perlmann and Weber⁵ and the author⁶. Present clinical observations tend to substantiate these experimental observations.

A few years ago, when this relationship was pointed out, some authors stated that there was a lack of evidence to indicate that deficiency in vitamin A existed among the people of this country. However, information is gradually being accumulated which indicates that mild degrees of vitamin A deficiency are more prevalent among the American populace than we have been led to presume. Dr. W. J. Ezickson and J. B. Feldman⁷ in 1937, by employing the dark adaptation or light sensitivity test, found that of 25 patients with urolithiasis 24 had pathologic dark adaptation varying from a mild to a severe degree. In a control group of 50 patients who were free from urolithiasis and were either normal individuals or had extra-urinary lesions, the dark adaptation test gave normal findings except for one patient with myxedema, one with juvenile diabetes, and two with jaundice. The group of patients with lithiasis consisted of 16 white men, eight white women, and one negress, the ages of the patients varying from 14 to 62 years.

In a group of individuals studied at the Cleveland Clinic, 68 or 72 per cent of the patients with renal calculi had a positive result from the biophotometer test of vitamin A deficiency. In the majority of our cases, the test showed normal results when adequate amounts of vitamin A were restored to the diet. This is in contrast to the observation of Ezickson and Feldman who found that 14 of 15 patients returning for recheck continued to show pathologic dark adaptation and only one showed improvement.

McCarrison² previously had stated that urinary stones were so prevalent in certain regions of India that these were designated as stone areas. He noted this frequent occurrence of calculi in regions where the diet of the inhabitants was definitely deficient in some way.

Joly⁸ in a similar clinical survey of calculous disease in England has stated, "In a universal survey of calculous disease, it is obvious that stones are more prevalent among people who live on a poor, monotonous diet, principally composed of carbohydrates than among those who partake of good and varied food."

Noble⁹, in Siam, found the largest number of stones in the poorer classes who lived in the agricultural dis-

tricts and the greatest incidence occurred in the first ten years of life. He states, "There is no doubt that the children who suffer from stone have had a diet deficient in vitamin A."

Jeghers¹⁰ similarly has stated, "More important, however, was the demonstration of the frequency of the clinically detectable vitamin A deficiency. He studied a group of 162 students attending Boston University School of Medicine and found that approximately 35 showed photometric evidence of vitamin A deficiency while 12 showed clinical evidence. Jeghers also noted that the factors responsible for producing the deficiency had been present for months and in some instances for years.

Youmans, in discussing Jegher's paper, stated that in using a similar photometer he found subnormal dark adaptation in one-half of 50 clinic patients, the diets of many of whom were thought to be inadequate. A similar observation was made in 11 of 54 supposedly normal subjects whose diets appeared to be well balanced.

Vermooten¹¹ recently has stated that renal calculi do not form in the South African Negro as illustrated by his study of 1,091,000 negro patients admitted to his hospital. Members of the white population of South Africa do, however, have renal calculi in the ratio of one in 460 admissions. He states that the negro lives on a diet which is rich in vitamin A, has an acid-ash base, and is low in calcium.

Jean¹² in 1936 utilized the photometer test for detecting vitamin A deficiency. In a study of 100 children of middle and low economic levels in a rural community, he observed that 26 per cent had a positive test of vitamin A deficiency. Of 102 children of all economic levels in a village, 53 per cent presented similar evidences. Of 70 children of upper economic levels in a city, 56 per cent gave a positive test of vitamin A deficiency and of a group of 70 children of middle economic levels in the city, 63 per cent gave a positive test. In a study of 62 children of low economic level in a city, it was noted that a positive curve of vitamin A deficiency was observed in 79 per cent. Of 78 village and city children who had a positive test of vitamin A deficiency and to whom adequate amounts of vitamin A were administered, all but three developed a normal adaptation to darkness after the period of vitamin A therapy.

Boshamer¹³, has stated that the various surgeons who operate in central parts of Southern China as well as Siam and Indo-China have been impressed by the frequency of calculous disease during the second to fourth

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7. Correction of vitamin B deficiency.

8. Dietary adjustment of the pH of the urine, depending upon the chemical constituents of the calculus and the pH of the urine from the kidney which harbored the calculus. No one diet is applicable for all patients and individual adjustment of this part of the postoperative routine is, we believe, of inestimable value. In addition, if the calculus is composed of uric acid or cystine, the foods should be low in purines or purine-free if possible. If it is composed of oxalates, a restriction of foods which are rich in oxalates is advisable.

The present status of the dietary regimen in the treatment of urinary calculi was presented in the *British Journal of Urology* in March, 1937, and before the Urological Section of the American Medical Association in 1936, but apparently some confusion still exists as to the indications and results which have followed use of this procedure.

First, it must be emphasized that this is only an additional procedure to be utilized with other well established methods for the prevention of calculi or recurrence of calculi.

In view of the fact that the majority of renal calculi produce some degree of obstruction in the calix or pelvis of the kidney, relatively few patients can be treated conservatively; yet series of cases have been described in the past in which conservative treatment was employed and treatment even continued when there was evidence of enlargement of the calculus. Clinical judgment should obviously indicate that conservative treatment should not be continued under such circumstances. In view of this fact, I wish again to present our views which, as stated previously, were cited in 1936 and 1937.

Bilateral Renal Calculi: In this group of cases, conservative treatment by dietary means has not given satisfactory results. In the majority of the cases I have seen, infection, stasis, and impaired renal function have been present. In several instances, a bilateral infection with the *Proteus* organism has been present and it was impossible to shift the pH of the urine to the acid side. Obviously, if this cannot be accomplished, the calculi will continue to enlarge as the alkaline salts continue to be precipitated. If the patient's condition does not justify surgical intervention, I have no hesitancy in prescribing the acid- or alkaline-ash diet, whichever may be indicated, in the hope that the pH of the urine can be adjusted to the point where precipitation of the urinary salts does not occur and the growth of the calculus may be retarded.

In instances of *large calculi* requiring nephrectomy, as I pointed out previously, due to the coexisting renal infection, stasis, and poor renal function, satisfactory results cannot be secured. Nephrectomy is advisable and dietary control instituted to minimize the possibility of a calculus developing in the opposite kidney.

In two of our cases, however, marked fragmentation of the calculus did occur.

Calculus in the Pelvis or Calix of the Kidney Which is not Producing an Obstruction: Unfortunately, the majority of the calculi produce varying degrees of obstruction and stasis, as evidenced by urographic study

by the intravenous method. As damage to the renal parenchyma is evident, conservative treatment is not advisable. In a small percentage of cases, however, there may not be any evidence of obstruction or stasis and, in these instances, I believe conservative treatment may be instituted if the patient is kept under close supervision. Recently at the meeting of the Southwestern Branch of the American Urological Society, a case was demonstrated in which three stones in the kidney had undergone dissolution by the use of the acid-ash diet. However, the urogram presented by the urologist revealed very little evidence of stasis. Therefore, clinical judgment must be employed in reaching a decision regarding utilization of the diet in this group and it should not be advocated indiscriminately.

There are, however, three groups of cases for which I believe the diet should be utilized:

1. *The Prevention of Recurrent Renal Lithiasis:* Up to the year 1932, our incidence of recurrence was 16.4 per cent, but, by the use of the high vitamin A acid- or alkaline-ash diet in conjunction with procedures we employed previously, we have reduced it to 4.7 per cent at the present time. These patients were Clinic and not dispensary patients; the latter may be difficult to handle from the economic or coöperative standpoint. Our patients were kept under close supervision, either by us or by the referring physician. Braasch has stated that calculi recur most frequently during the first two years following operation and we concur with this opinion, especially since making a review of the last one hundred patients who came to the clinic because of urinary calculi, and we feel quite optimistic regarding the permanent prevention of recurrence by use of this regimen if the pH of the urine can be controlled.

2. *Prevention of the Formation of Calculi in Patients Who Pass Small Stones at Frequent Intervals but in Whom a Calculus is not Demonstrable in Either Kidney:* In this group of patients, determination of the chemical constituents of the calculi which have been passed is of considerable importance as well as a study of the pH of the urine from each kidney. I believe satisfactory results may be secured and the incidence of calculus formation minimized by shifting the pH of the urine to a point at which the salts which comprise the calculus are maintained in complete solution.

3. *Prevention of the Formation of Calculi in Patients With Orthopedic Problems:* A review of the literature reveals that the formation of a renal calculus in a patient required to remain in the recumbent position for a long period of time is not an unusual occurrence. In the majority of cases that have been reported in the literature, the calculus was composed chiefly of calcium phosphate, a salt which precipitates in alkaline urine. Therefore, in this group of patients, the high vitamin A acid-ash diet is prescribed, the pH of the urine being maintained at a point at which the alkaline salts are held in solution. I believe that alkaline urinary antiseptics should not be employed here as the pH of the urine is shifted to the alkaline side and precipitation of phosphates and carbonates enhanced.

Conclusions

1. A careful search for etiologic factors associated with the formation of the primary renal calculus is necessary to minimize the development of a recurrent calculus.
2. Indiscriminate use of the acid- or alkaline-ash diet in the treatment of patients with renal calculi should be avoided.
3. Control of the pH of the urine by dietary means in addition to our other procedures is of value in preventing the formation of true recurrent calculi.
4. The operative removal of a calculus is but one phase in the management of a patient with renal lithiasis and a carefully followed postoperative regimen is necessary.

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