Bladder disorders of diabetic patients have been recognized for more than a century. These alterations have been extensively explored in adult diabetics, but not in children inasmuch as most of the means used for diagnosis cause discomfort and are associated with complications. The use of echography as a non-invasive and totally harmless mean of diagnosis for the determination of vesical volume and the presence of vesical urinary residues permits its application in the diagnosis of bladder function disorders in diabetic children.

In the present paper we intend to report our experiences and for this purpose the determination of vesical volume patterns, vesical evacuation, and volume of first morning diuresis in a normal group of control was required; these data were not available in our country.

MATERIAL AND METHODS

Fifty-five insulin-dependent diabetic children aged 6 to 14, and under treatment at the Department of Child Endocrinology of the National Institute of Endocrinology and Metabolism (NIEM) were studied. Patients with congenital genitourinary tract disorders, with confirmed chronic renal diseases or not able to attain a satisfactory metabolic control within the 72 h prior to the investigation were excluded from the study. The criterion of satisfactory control used for this purpose was based on the presence of 0 or 1+ total qualitative 24 h glycosuria and prior to breakfast, lunch, dinner and at 22:00.

Key-words: Bladder disorders; Diabetic bladder; Diabetic children; Echography; Morning diuresis; Residual urine; Vesical volume.

Received: December 17, 1982.
The control group studied comprised 40 non-diabetic children of the same age group; those presenting low stature or genitourinary disorders were not included.

Distribution by sex and age of both groups was similar: controls 45% males and 54% females; diabetics 45.45% males and 54.55% females. Age distribution was very similar in the two groups, with a larger number of children within the 11 to 14 year range in both.

Early morning diuresis, vesical echography for determination of vesical volume and incomplete vesical evacuation were measured in both groups.

Early morning diuresis - First morning micturition was determined on three consecutive days.

Vesical echography - This technique was always performed by the same technical personnel at the x-ray Department of the Institute of Oncology and Radiobiology. A SONOLAYER Model SAL-20A for the gray scale and real time of 3.5 MHZ was used.

Diabetic patients were required to maintain a satisfactory metabolic control and normal diet during the 72 h prior to investigation. The night before the test, children were instructed to evacuate bladder before going to bed and not to consume liquids nor micturate until 07° the next day, which was the time scheduled for the test. Sagittal and transverse diameters, as well as depth of the bladder were measured, while the children were in a supine position.

They were then required to evacuate the bladder and immediately after the bladder was explored for determination of residual urine.

The following equation was used for vesical volume determination:

\[ V.V. = 0.52 \times A \times B \times C \]

where, A, B, and C are the three diameters studied\(^1\).

Maximum vesical volume considered for each age was \( \bar{x} \pm 2 \text{SD} \); the same procedure was used for maximum early morning diuresis.

The presence of increased vesical volume in relation to age, incomplete vesical evacuation or increased early morning diuresis were considered urinary bladder disorders.

RESULTS

Table 1 shows the mean vesical volume and standard deviation by age in children of both groups. Vesical volume was significantly greater in children with diabetes than in controls (p < 0.05 and p < 0.001).

Average overall vesical volume was 202.44 ml and 381.93 ml for controls and diabetic children, respectively.

Vesical volume of both groups was fitted according to the normal distribution curve bearing in mind that our series were obtained from a limited population. A normal distribution was confirmed for both groups.

Comparing values for maximum vesical volume by age in controls with those of diabetic children, it was observed that 24 of the 55 patients exhibited vesical volume increase (43.6%).

Table 2 shows the mean volume of first morning micturition for each age group and a significantly greater value is observed in the diabetic children as