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## Use of the D-Xylose Absorption Test in Monitoring Intestinal Allografts

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With the cumulative survival of intestinal transplant recipients, several nutritional parameters have been used at the University of Pittsburgh for the monitoring of intestinal allografts.<sup>1</sup> The purpose of this study was to analyze the effectiveness of the D-xylose absorption test as an indicator of intestinal allograft function.

### MATERIALS AND METHODS

From May 1990 until April 1993, 43 patients underwent intestinal transplantation at the University of Pittsburgh. Fifteen received an isolated intestinal graft, 21 received an intestine in combination with a liver, and 7 received a full multivisceral graft. Twenty-one were adult and 22 were pediatric recipients. An overall total of 127 D-xylose absorption tests were performed on 20 adult and 14 pediatric recipients. The D-xylose absorption test was performed two to nine times in adult recipients and one to six times in pediatric recipients. In adult patients, 25 g of D-xylose was given orally and serum D-xylose levels were measured at 0, 30, 60, 90, 120, 150, 180, 210, and 240 minutes after the administration of the oral dose. In pediatric recipients, 14.5 mg of D-xylose per m<sup>2</sup> body surface area was given either orally or through a gastrostomy tube and serum D-xylose levels were measured at 0, 30, 60, 90, and 120 minutes. Spectrophotometry was used for the measurement of D-xylose concentration in mg/dL after mixing the latter with glacial acetic acid containing thiourea at 70°C resulting in the formation of furfural which in turn was allowed to react with para-bromoaniline.<sup>2</sup>

The maximum serum D-xylose levels were used to analyze the influence of (1) renal dysfunction, (2) postoperative period, (3) rejection, and (4) cytomegalovirus (CMV) enteritis. Student's *t* test and analysis of variance (ANOVA) were used for statistical analysis, *P* < .05 was regarded as statistical difference.

### RESULTS

(1) Patients with creatinine level greater than 1.5 mg/dL had a significantly higher maximum D-xylose level compared with patients with a creatinine equal to or less than 1.5 mg/dL ( $42.8 \pm 5.6$  vs  $30.3 \pm 9.0$ , *P* = .0372). (2) The maximum D-xylose level in the early postoperative period (6 to 30 days) was significantly depressed compared with the value obtained in the same patient in the late postoperative period (32 to 375 days;  $32.3 \pm 8.4$  vs  $18.0 \pm 6.3$ , *P* = .0001). (3) Seven patients had histologically documented intestinal allograft

rejection (five moderate to severe and two chronic) with D-xylose absorption tests performed during that time. The maximum D-xylose level of this group was significantly reduced when compared with a control group of patients with stable allograft and normal renal function ( $16.3 \pm 3.7$  vs  $30.3 \pm 9.9$ ,  $P = .0027$ ). (4) Histologically documented CMV enteritis was present in 11 recipients, of whom 8 had undergone a D-xylose absorption test at that time. The patients with CMV enteritis had a lower maximum D-xylose level than the control group, although no statistical difference was found ( $23.6 \pm 10.0$  vs  $30.3 \pm 9.9$ ,  $P = .126$ ).

## DISCUSSION

The interpretation of the results of the D-xylose absorption test in intestinal allograft recipients was complicated by the presence of a large variation in D-xylose values between individuals as well as by impaired renal function and abnormal gastrointestinal motility. However, the analysis of our accumulated data of the D-xylose test has revealed certain trends.

The maximum D-xylose level was uniformly reduced in the intestinal allograft recipients during the first postoperative month presumably secondary to the ischemic damage of the intestinal allograft. Also the maximum D-xylose level was significantly depressed in moderate to severe acute rejection as well as chronic rejection, but less affected by CMV enteritis. In the presence of renal insufficiency, the maximum D-xylose level appears to be higher than real values because of delayed elimination of D-xylose. In these cases a comparison of a serial monitor of the D-xylose test in individual recipients is useful.

In conclusion, the D-xylose absorption test is a valuable adjunct in the monitoring of intestinal allograft function when used in conjunction with clinical, radiologic, endoscopic, and histopathologic parameters. It is a useful index for the modification of nutritional support according to changes in intestinal allograft absorption in the early postoperative period and during episodes of significant rejection or CMV enteritis.

## REFERENCES

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