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Uniformity of dissecting microscope appearances in proximal small intestine

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SUMMARY The uniformity of mucosal morphology within the distal duodenum and the first loop of jejunum, ie, the area usually biopsied, was examined at necropsy in 116 children. In those with no evidence of gastrointestinal disease there was no significant variation within this area, but in 25 children with mucosal abnormality, variation occurred within a small area. The crests of the plicae circulares were more often more severely abnormal than the area in the valleys between. Owing to the small size of biopsy specimens, it is apparent from this study that such specimens may not be representative of the proximal small intestinal mucosa in children suffering from the disorders of the small intestine encountered in this study.

It is often considered that a single small bowel mucosal biopsy is representative of the area of the small intestinal mucosa which has been biopsied, although there are few studies in children or adults which have investigated the uniformity of morphology of the intestinal mucosa within the area ordinarily biopsied, ie, the distal duodenum and first loop of jejunum. Recently, attention has been drawn to the patchiness of abnormalities of the proximal small intestinal mucosa in patients with dermatitis herpetiformis (Brow, Parker, Weinstein, and Rubin, 1971), thus emphasizing that a single mucosal biopsy may not be representative of mucosal morphology within the biopsy area.

Creamer and Leppard (1965) have described in detail the distribution and extent of the flat mucosa in an adult with the 'coeliac syndrome' by examining partly autolysed small intestine under the dissecting microscope at necropsy and have demonstrated that in the most proximal part of the small intestine the mucosa was uniformly flat, but as the abnormality became less severe along the length of the small intestine variation at any one level became greater.

The purpose of this paper is to report the uniformity of small intestinal mucosal morphology within the distal duodenum and first loop of the jejunum, ie, the biopsy area, in a group of children studied at necropsy.

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Materials and Methods

The small intestine taken from 116 childhood necropsies was examined with the dissecting microscope using a technique (Walker-Smith, 1969) similar to that described by Creamer and Leppard (1965). Small intestine which had stood for 24 hours in running water was stained with ordinary ink and was examined under the dissecting microscope and the appearances were recorded and photographed. The appearances right along the length of the small intestine were observed as part of a general survey of intestinal morphology, but particular attention was paid to the proximal small intestine (Walker-Smith, 1970). The descriptive terminology used to describe the appearances seen was that of Walker-Smith (1969).

Using this method of examination the surface epithelium is lost and the surface of the preparation is the basement membrane, ie, villous cores, are observed rather than intact villi.

Results

Sixty-one of the children studied had had during life no clinical evidence or at necropsy had any pathological evidence of disease of the gastrointestinal tract (non-gastroenterological group). In this group the mucosa was fairly uniform within the biopsy area although there was some variation in width of villous core forms within a small area

Fig. 1 *Dissecting microscope appearances of mucosa characterized by leaf-like villous cores of varying width and height* × *40.*

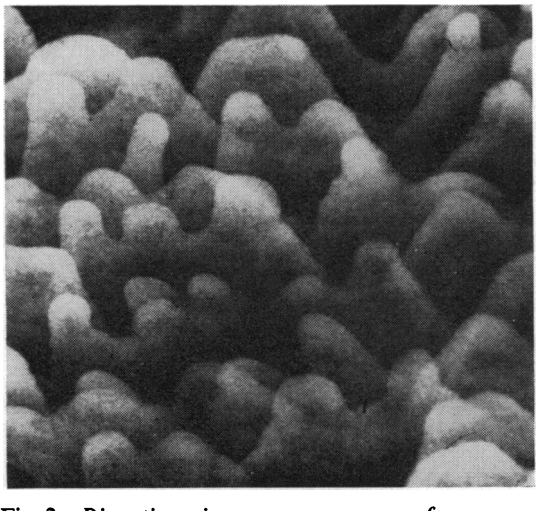

Fig. 2 *Dissecting microscope appearances of mucosa characterized by tongue-like, leaf-like, and occasional finger-like villous cores* × *40.*

(Figs. 1 and 2). However, a random biopsy from such cases would be representative of the overall morphology of this area of the small intestine. This area was usually morphologically different from appearances seen in the distal ileum. An example of this is represented diagrammatically in Figure 3. There was a trend for villous cores to be broader in the proximal small intestine as compared to the ileum.

In 55 children there had been evidence of disease of the gastrointestinal tract during life (gastroenterological group). In this group there was a significant variation in morphology within the biopsy area in 24 out of 25 children with an abnormal mucosa. The diagnoses in these children are listed in the Table. The most frequently observed variation was a difference between the morphology on the crests of the plicae circulares or mucosal folds and morphology in the valleys between these folds. In

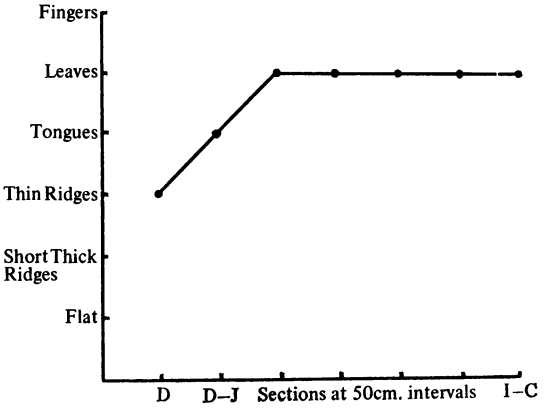

Fig. 3 *Distribution of villous core appearances along the small intestine in a child of 2 years.*

Fig. 4 it can be seen that the mucosa is virtually flat on the top of one of these folds, but on the sides of the folds there are short, thick ridges and in the valleys there were thin, ridge-like villous cores. In Fig. 5 is an example of duodenal mucosa characterized by short, thick ridges with a convoluted appearance on the top of the fold. In the valleys between the folds there were thin, ridge-like villous cores. This type of morphological abnormality with severer abnormalities on the tops of folds was seen particularly in children who had died as a sequel to enteritis, but was present to some extent in all children who had an abnormal mucosa, except the child with aganglionosis of the small intestine whose mucosa in the biopsy area was within normal limits.

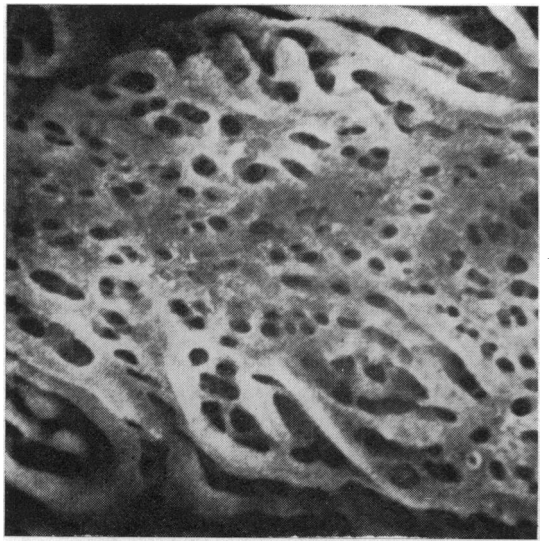

Fig. 4 *Dissecting microscope appearance of flat mucosa in duodenum on the crest of a mucosal fold* × *40.*

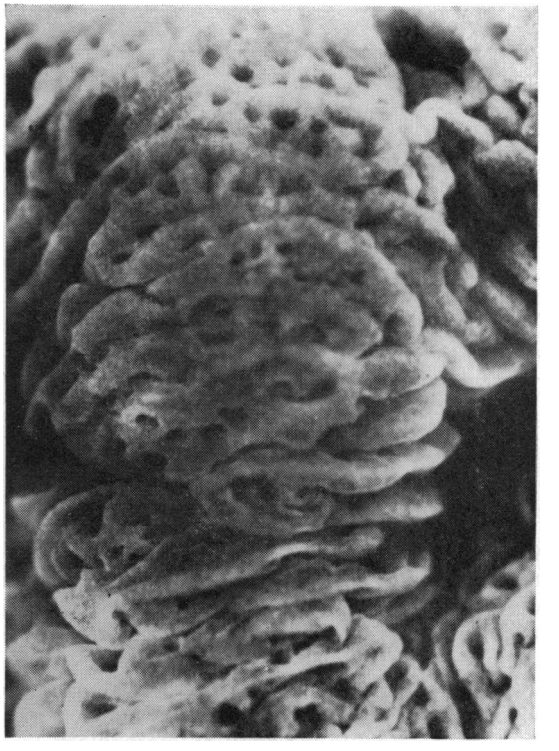

Fig. 5 *Dissecting microscope appearances of short, thick ridges in the duodenum on top of a mucosal fold* × *40.*

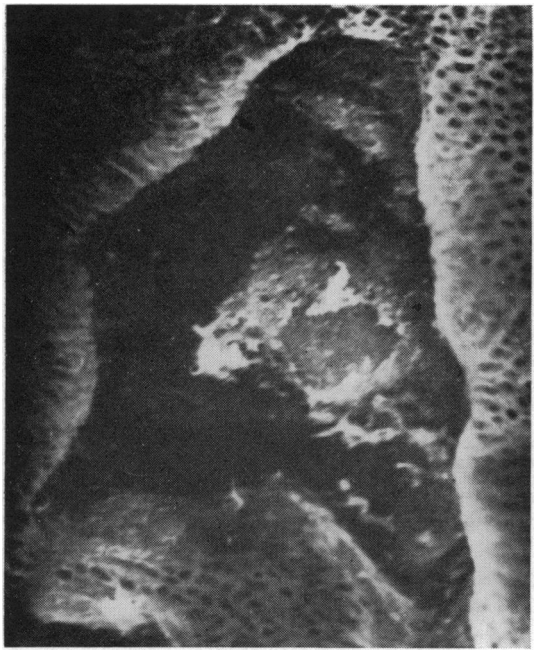

Fig. 6 *Dissecting microscope appearance of the duodenum with a large ulcer; the edge of ulcer is flat* × *18.*

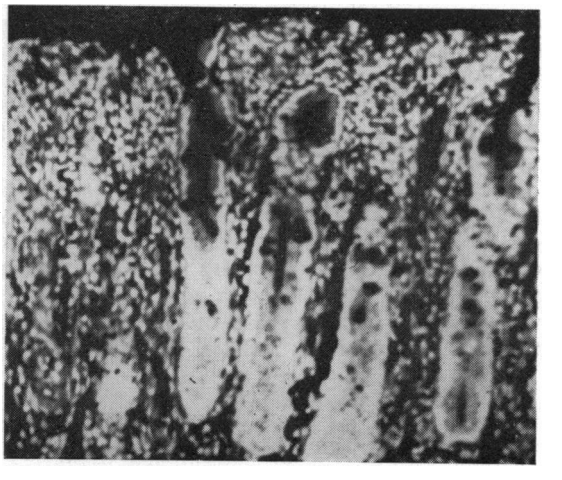

Fig. 7 *Subtotal villous atrophy seen in the specimen near the ulcer* × *40.*

Diagnosis	*Number of Children*
Acute enteritis	5
Acute entero-colitis	2
Cystic fibrosis with acute enteritis	1
Cystic fibrosis with ileal atresia	1
Cystic fibrosis with ulcerated mucosa	1
Intestinal stenosis or atresia	4
Peritonitis	2
Septicaemia	2
Cytomegalo-virus infection	1
Small intestinal lymphangioma	1
Hirschsprung's disease with entero-colitis	1
Hirschsprung's disease with small intestinal aganglionosis	1
Moniliasis	1
Hepatic necrosis and cerebral anoxia	1
Renal disease	1

Table *Diagnosis in children with an abnormal mucosa*

In several of these children who died as a sequel to enteritis or entero-colitis there was ulceration of the small intestine, as seen in Fig. 6, and the mucosa on the edge of these ulcers was often flat and had a histological appearance very similar to that seen in coeliac disease (Fig. 7), whereas mucosa further away from the ulcers, characterized by tongue-like villous cores, had a normal histological appearance, ie, there was a big variation in morphology in a small area.

Part of the small intestine either proximally or distally was flat in five children out of the 55 children in the gastroenterological group. These were two children who died as a sequel to acute enteritis, one child with cystic fibrosis and ileal atresia, one child with a severe monilial infection of the alimentary tract, and one child with Hirschsprung's disease where the aganglionosis extended to the distal two-thirds of the small intestine. The whole of this distal aganglionic intestine was uniformly flat under the dissecting microscope (Walker-Smith, 1971). In the other cases the flat mucosa was patchy in its distribution, but was found chiefly on the tops of mucosal folds in the proximal small intestine.

One child who had at necropsy a small intestinal lymphangioma had a diffuse lymphatic abnormality of the entire small intestine along its length. The distribution of this abnormality was very irregular (Walker-Smith, Reye, Soutter, and Kenrick, 1969) with large lymphatic masses mixed with normal finger-like villous cores and leaf-like villous cores.

Discussion

Although the surface epithelium of the mucosa in the specimens examined had undergone autolysis leaving the basement membrane of the mucosa as the surface, observations of the three-dimensional morphology with the dissecting microscope, made from the examination of this 'skeleton' of the mucosa or cores of villi, ie, villous cores, have been shown to be of comparable appearance to the dissecting microscope appearances of fresh small intestinal biopsies (Walker-Smith, 1970). Thus, observations made from such postmortem findings are relevant to the observations which could be made from small intestinal biopsy specimens.

It must be concluded from the observations made on those children with small intestinal disease that mucosal biopsy only a few square millimetres from the proximal small intestine may often not be truly representative of the overall morphology of that part of the small intestine in children affected by the diseases observed in this study. Such a biopsy is certainly not representative of mucosal morphology along the length of the small intestine. Whilst one would not ordinarily biopsy a child with acute entero-colitis such a disease may be followed by chronic diarrhoea and failure to thrive and biopsy may then be performed. So in interpreting biopsy findings in such situations, these observations should be borne in mind. Similarly, a child suspected strongly on clinical grounds of having intestinal lymphangiectasia may need more than one biopsy if the first is normal.

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