Technique

Peroral small-intestinal biopsy: experience with the hydraulic multiple biopsy instrument in routine clinical practice

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SUMMARY Experience of the peroral, hydraulic, multiple, small-bowel biopsy instrument is recorded and compared with reported experience of other peroral biopsy instruments. It is concluded that, in routine clinical practice, there is no particular danger associated with this instrument despite warnings to the contrary. Furthermore, biopsies are obtained at least as quickly as with other instruments and with great reliability. Since this instrument also enables multiple, precisely located biopsies to be taken from various levels of the small intestine, it could be considered the instrument of choice for peroral jejunal biopsy.

The introduction of peroral suction biopsy instruments specifically designed to sample the small intestine by Royer et al. (1955) and Shiner (1956), has placed the diagnosis and management of patients with small bowel disease, especially coeliac disease, on a much more rational basis. Perhaps the most frequently used instrument is the Crosby capsule (Crosby and Kugler, 1957) but this and similar instruments suffer from the inability to take more than one biopsy. A valuable innovation was the ‘multipurpose’ instrument (Brandborg et al., 1959) which allows up to four biopsies to be taken, but at only one site. For multiple sampling at different levels of the small intestine, the simplest instruments are the Carey and Choudhury capsules (Carey, 1964; Choudhury et al., 1964) but these suffer from the disadvantage that the specimens are all stored together in the capsule so that the valuable information of the site from which each biopsy was taken is lost. This problem is overcome by the hydraulically operated instruments which deliver specimens to the operator as soon as they are taken thus allowing multiple biopsies to be taken from precisely located sites (Baker and Hughes, 1960; Flick et al., 1961; Lehmann, 1961; Bolt et al., 1962). Complications, although rare, have been reported with nearly all these instruments. The majority seem to have been with the Crosby capsule (Rubin and Dobbins, 1965) but this probably merely reflects its more frequent use. The most serious complications have been massive haemorrhage (Vidini and Finlay, 1964) and perforation with peritonitis (Clarke, 1964); bacteraemia has also been observed (Petty and Wenger, 1970). An impression of particular danger associated with the use of the hydraulic instrument has been given by a report of complications (Dobbins et al., 1963) and a recommendation by the same group (Rubin and Dobbins, 1965) that the instrument should not be used for routine clinical purposes because of its greater dangers and technical difficulties. These recommendations may perhaps partly explain why these instruments are not more widely used. However, the complications quoted by Dobbins et al. (1963) were nearly always in patients in whom the ileum had been biopsied, sometimes over long periods (up to 18 hours), before and after gluten instillation. These were highly unusual situations and in routine clinical practice one would normally be content with several biopsies from the proximal small bowel taken over a short period (10 to 20 minutes). It was therefore considered important to record experience of this potentially very useful instrument in more usual clinical situations.

METHODS

Biopsy Technique
Biopsies were taken with the hydraulic instrument (Flick et al., 1961) supplied by Quinton Instruments,
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Seattle, USA, using the following technique.

The prothrombin time is checked beforehand and corrected if necessary with vitamin K. After an overnight fast the patient lies on the fluoroscope examination table and the tube is quickly passed by mouth into the oesophagus and thence into the stomach, this part of the procedure taking no more than 10 seconds. If at this stage the patient is distressed or if very apprehensive before the procedure, intravenous diazepam is given to induce drowsiness. If this is necessary, then intravenous metoclopramide is given at the same time both to reduce nausea and increase peristalsis.

The patient is moved onto the right side and the tube pushed through the pylorus sometimes assisted by manual palpation of the abdomen, then returned to the supine position and the tube pushed into the second part of duodenum. Moving onto the left side then enables the tube to be advanced to the duodenojejuninal junction. Further positioning then allows the tube to pass just beyond the duodenojejuninal junction into the first loop of jejunum and, if desired, beyond. The position of the tube is checked frequently by fluoroscopy, both while positioning the tube and while taking the biopsies.

Usually three biopsies are taken from just past the duodenojejuninal junction (with additional ones for enzyme estimations, histochomistry or immuno-fluorescence where appropriate). The tube is then withdrawn and three other biopsies taken from the distal end of the second part of duodenum. The tube is then withdrawn completely, and the patient sent to the ward where pulse and blood pressure are recorded at least hourly for four hours after which, provided the condition is satisfactory, the patient may be allowed home, with appropriate instructions.

Each biopsy is delivered to the operator as soon as it is obtained. Within a few minutes, each specimen is placed on a finger and uncurled with the side of a needle so that the cut surface is uppermost. This cut surface is then touched with a square of plastic mesh to which it adheres. The luminal surface is now uppermost and is placed, correctly orientated, onto the stage of the stereomicroscope and immersed in fixative (formolsaline). With side lighting the mucosal surface is examined and photographed. The specimen is then sent for routine histology.

Record was kept of (1) the time taken from the start of intubation to obtaining the first specimen from past the duodenojejuninal junction, (2) failure to obtain a biopsy, (3) complications, and (4) number of patients requiring sedation.

Subjects

Biopsies were attempted personally by one of the authors over the course of three years, on a total of 146 patients on 184 occasions. Details of the final diagnosis or principal reason for biopsy of these patients are shown in the Table. The ages ranged from 14 to 80 years.

Results

Duration

The duration of the procedure became much reduced with experience. On the last 68 occasions the average time taken from the start of intubation to obtaining the first biopsy from just past the duodenojejuninal junction was 15 minutes (range five to 35 minutes).

Sedation

Intravenous diazepam was required on 40 of the last 80 occasions, the dose ranging from 5 mg to 20 mg.

Failures

Failure to obtain a biopsy occurred on five (2.7%) of the 184 occasions. In all five cases there appeared to be a hold-up at the pylorus, there having been no difficulty in passing the tube into the stomach. Two of these patients had had a successful biopsy earlier in the series, one was a patient with coeliac disease and the other was being investigated for possible hypobetalipoproteinanaemia and had been given a fatty meal immediately before the procedure.

Total Number of Biopsies Obtained

Approximately 1800 biopsies were obtained on 184 occasions.

Complications

Three-quarters of the patients were inpatients and were observed closely in hospital for at least a week after biopsy. The remainder were observed for at least four hours before being allowed home. These were usually followed up in the gastroenterology

<table>
<thead>
<tr>
<th>Final diagnosis or principal reason for biopsy</th>
<th>No. of patients</th>
<th>No. of occasions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coeliac disease</td>
<td>35</td>
<td>69</td>
</tr>
<tr>
<td>Dermatitis herpetiformis</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>No organic disease (mostly considered to be irritable colon syndrome)</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Post-gastrectomy</td>
<td>12</td>
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<tr>
<td>Anaemia</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Cirrhosis</td>
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<td>8</td>
</tr>
<tr>
<td>Weight loss or small stature</td>
<td>7</td>
<td>7</td>
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<td>Pancreatitis or cystic fibrosis</td>
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<tr>
<td>Crohn's disease</td>
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<td>Diarrhoea</td>
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<tr>
<td>Miscellaneous</td>
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<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>146</strong></td>
<td><strong>184</strong></td>
</tr>
</tbody>
</table>
clinic within one month. Although a small amount of bleeding seems inevitable after biopsy and the fluid delivered with the biopsy to the operator is frequently blood-stained, a significant haemorrhage occurred on only one occasion. This was in a patient with untreated coeliac disease on whom biopsies had been attempted unsuccessfully on previous occasions using a Crosby capsule. Biopsies were taken subsequently at intervals of some months with the multiple biopsy instrument without incident. The bleeding in this patient became apparent within two hours. She was given 2 units of blood and the bleeding stopped spontaneously. Two patients complained of fairly severe abdominal pain, with slight central abdominal tenderness settling spontaneously over the next 48 hours.

Discussion

In routine clinical practice, use of the hydraulic biopsy instrument has been found to be a safe, quick, and reliable means of obtaining small bowel mucosa from the duodenum and proximal jejunum, providing precisely located, multiple biopsies.

Of approximately 1800 biopsies taken on 184 occasions the only serious complication was a significant haemorrhage in one patient. This complication rate is similar to that associated with the Crosby capsule (one haemorrhage in 700 biopsies taken from 284 adult patients (Sheehy, 1964) and three in 1407 biopsies taken from adult patients (Greene et al. 1974) and with the infant multipurpose tube (one in 320 biopsies from 102 patients (Ament and Rubin, 1973)) but rather higher than with the adult multipurpose tube (three in 4200 biopsies from 2000 patients (Perera et al., 1975)). The low complication rate observed in this study contrasts with that observed with a similar instrument in experimental situations—four in 959 biopsies taken on 84 occasions (Dobbins et al., 1963).

The overall failure rate of 2.7% was low and compares favourably with 3% experienced by Greene et al. (1974) using the Crosby capsule. On no occasion was there failure to pass the hypopharynx compared with two of 69 attempts using the Shiner tube (Shiner, 1957) and nine of 284 attempts using the Crosby capsule (Sheehy, 1964). Failure to pass the pylorus was the only cause of failure in this study, occurring in five of 184 attempts, compared with four of 284 attempts with the Crosby capsule (Sheehy, 1964), 18 of 69 attempts using the Shiner tube (Shiner, 1957), and four of 147 patients using the multipurpose tube (Brandborg et al., 1959).

There was no instance of instrument failure—that is, failure to obtain a suitable specimen when the capsule was correctly positioned—compared with 30 such failures in 284 attempts with the Crosby capsule (Sheehy, 1964), and five of 147 patients using the multi-purpose tube (Brandborg et al., 1959).

The short duration of the procedure, averaging 15 minutes to the first specimen, is probably aided by the semi-rigid nature of the tubing, allowing it to be pushed into place, and similar results have been obtained with the Crosby capsule used in conjunction with an outer, more rigid sleeve (Evans et al., 1970), and with the multipurpose tube. This interval is considerably shorter than that reported with the Shiner tube—1½ to two hours (Shiner, 1957), the Carey capsule—one to five hours (Carey, 1964), or the Crosby capsule without the outer sleeve—15 to 60 minutes in children (Greene et al., 1974).

The larger diameter tubing of the hydraulic instrument is probably responsible for more discomfort and retching than with the unmodified Crosby capsule (albeit for a shorter period) and sedation was given to half the patients. No sedation was given to the adults in the series by Greene et al. (1974), but most of the subjects were healthy male volunteers.

It is concluded that, although serious complications can occur with almost any biopsy instrument, there is no particular danger associated with the hydraulic instrument in routine clinical practice in adult patients and that it is as safe as the more commonly used Crosby capsule, although probably not quite as safe as the multipurpose tube. However, even with that tube both perforation and haemorrhage have been reported (Kuitunen and Visakorpi, 1965; Perera et al., 1975). In view of the relatively high incidence of patchiness of the mucosal lesion in coeliac disease (as well as in dermatitis herpetiformis), multiple biopsies from different levels of the small intestine are necessary for diagnosis and especially for assessment of the effects of treatment (Scott and Losowsky, 1975). The hydraulic multiple biopsy instrument may thus be considered the instrument of choice for obtaining peroral small-intestinal biopsies in this condition, although an alternative, preferred by some, is repeated passage of the multipurpose tube (Perera et al., 1975).

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