

A Rectal Suction Biopsy Tube for Use in the Diagnosis of Hirschsprung's Disease

By HELEN R. NOBLETT

WHILE EVALUATING THE USE of rectal suction biopsy in the diagnosis of Hirschsprung's disease in newborn infants and young children, a need was found for a suction biopsy instrument which was capable of yielding specimens of rectal submucosa suitable for accurate histological interpretation.

Originally, a multipurpose biopsy tube¹ was used to obtain biopsy specimens, following the work of Dobbins and Bill.² This tube was later modified to produce an instrument specifically designed to provide rectal biopsy specimens suitable for accurately establishing the presence or absence of ganglion cells in the submucosal plexus.

The instrument has the following characteristics:

1. It consistently yields a mucosal biopsy specimen 3.5–5 mm. in diameter with at least 2 mm.² of attached submucosa, and minimal tissue distortion.

2. The biopsy tube can be positioned with relative accuracy on a predetermined quadrant of the rectal wall above the hypoganglionic zone described by Aldridge and Campbell³ without sigmoidoscopy.

3. It yields multiple biopsy specimens even in the neonate with a minimal risk of complications such as perforation, hemorrhage, and consequent fibrosis occurring, in contrast to full-thickness rectal biopsies.⁴

4. It is simple to manipulate; no anesthesia is necessary. It can be used in sick newborn infants being nursed in incubators as well as in patients of any age as an outpatient procedure.

THE INSTRUMENT

The Rectal Suction Biopsy Tube* is a modification of the Gastric Biopsy Tube originally described by Wood et al. in 1949.⁵ The working principle of the instrument is that a small portion of rectal mucosa and submucosa is drawn into the side aperture of a biopsy capsule by suction, manometrically measured, and then excised by the piston-like movement of a cylindrical knife enclosed within the capsule.

The instrument (Fig. 1) consists of a hollow cylindrical knife (A) ground on its inner surface to give a sharp leading edge. The knife (length 12 mm., diameter 3 mm.) is screwed to a central operating wire (B) which extends through the whole length (25 cm.) of the instrument and is attached by a screw-clamp to one arm of a Jackson-Negus handle (C). Both the knife and central wire are enclosed in an outer tube made up of three parts: the biopsy capsule (D), the flexible tube (E), and the "suction-handle" unit (F).

The hollow biopsy capsule (D) is 2.5 cm. in length and 6 mm. in diameter; 2.0 cm. from its rounded tip there is a counter-sunk side aperture (G) 2.5 mm. in diameter.

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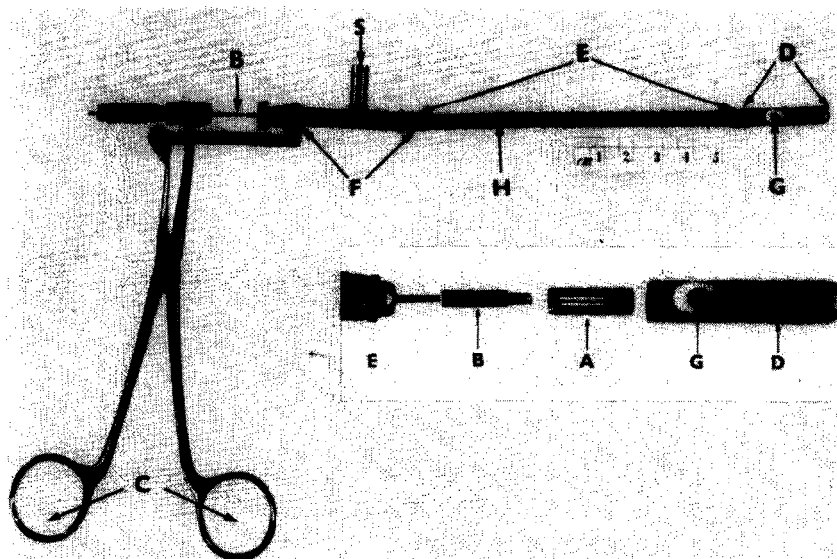


Fig. 1.—Rectal Suction Biopsy Tube assembled for use. **Inset:** Biopsy capsule and cylindrical knife dismantled. (A) cylindrical knife; (B) central operating wire; (C) Jackson-Negus handle; (D) biopsy capsule; (E) flexible tube; (F) suction handle unit; (G) side aperture; (H) longitudinal marker; (S) side arm for connection to suction.

The internal diameter of the capsule accommodates the cylindrical knife in such a way that there is a perfect sliding fit.

The capsule is attached to a flexible tube (E) (length 12 cm., diameter 5 mm.) which is made up of a length of Bowden spring covered by a closely fitting vinyl tube on which is painted a longitudinal marker (H) and a centimeter scale. The marker points to the site of the side aperture in the biopsy capsule, when it is firmly screwed into position, and the scale indicates distances measured along the tube from that side aperture, the first mark on the tube being 2 cm. from the side aperture.

The "suction-handle" unit (F) consists of a stainless steel tube fixed to one arm of a Jackson-Negus handle (C). It has a side arm (S) through which suction can be applied and is joined at one end to the flexible tube (E). The other end is closed by an airtight lock through which the central operating wire (B) can be moved by manipulation of the attached handle.

Suction is applied by a 50 cc. Luerlok syringe. The syringe is connected to a vacuum gauge (calibrated in inches of mercury) which is attached to the side arm (S) by a piece of rubber tubing.

By a simple opening and closing movement of the handle, the knife is moved with a piston-like action inside the biopsy capsule. In the open position, the knife is situated near the rounded end of the capsule, and the side aperture is open. In the closed position, the knife occludes the side aperture.

TECHNIC

With the knife in the closed position, the suction biopsy tube is passed gently into the patient's rectum. The side aperture, as indicated by the longitudinal marker on the flexible tube, is faced to the quadrant of the rectal wall to be biopsied. The biopsy capsule is placed 3–4 cm. above the anal valves as indicated by the centimeter scale.

The tube is held in position by the operator's left hand situated just outside the anus, slight lateral pressure being applied at the same time to press the side aperture firmly against the mucosal surface. The operator then moves the knife to the open position by manipulating the handle with his right hand and the assistant rapidly applies suction of 20 to 25 inches of mercury for 2 to 3 seconds by the syringe while the knife is rapidly closed. Slight resistance is usually noted as the specimen is cut.

After removal of the tube from the rectum, the capsule is unscrewed from the flexible tube, and the biopsy specimen is removed, using fine dissecting needles to minimize tissue trauma. If the specimen is considered adequate it is carefully mounted, mucosa uppermost, on a centimeter square of teflon mesh and immediately fixed in buffered 10 per cent formalin.

At least two adequate biopsies are required from each level. A biopsy specimen is inadequate if less than 3.5 mm. in diameter, if no submucosa can be identified, or if a submucosal lymphoid follicle is identified in the biopsy material.⁶ No specimen is adequate if it has been taken within 3 cm. of the anal valves.

DISCUSSION

We have taken 116 biopsy specimens from 45 children of all ages including newborn infants with this instrument. All specimens were considered adequate for the diagnosis of Hirschsprung's disease. No complications followed these biopsies. A few drops of blood were occasionally passed after the procedure, but continuous bleeding was not encountered.

Although the negative pressure of 20–25 inches Hg used is high, the risk of perforation appears minimal, since none of the biopsy specimens contained any of the circular or longitudinal muscle coats of the rectum. Biopsies taken at 5–10 inches Hg pressures¹ were unsatisfactory as they yielded an inadequate depth of submucosa. Inadequate specimens may also be obtained if the suction is applied for less than the 2–3 seconds recommended. The depth of submucosa obtained is also reduced if the mucosa is edematous, as it is after bowel wash-outs or enemas. For this reason, biopsies are best taken before such measures are commenced.

Careful maintenance of the instrument is necessary. The knife is sharpened periodically and interchangeable knife cylinders are used to reduce the wear on any particular blade. The instrument is tested before each biopsy to see that the knife moves smoothly inside the capsule. Remnants of dried blood or feces in the instrument will greatly reduce the cutting ability of the knife. All connections are tested regularly to ensure that the suction system is airtight.

During the biopsy, care is taken to leave the knife in the closed position until suction is to be applied. If this practice is not followed a large amount of fecal material may enter the tube before the biopsy is taken.

A rectal examination is carried out before each biopsy. Small infants sometimes tend to expel the tube as it is inserted. In such circumstances it may be necessary to hold the tube in position with a finger in the infant's rectum. Only minimal lubrication is used to avoid large quantities of lubricant being sucked

into the capsule. This is of particular importance if the biopsy specimen is to be used for fluorescent microscopy studies.

Although this technic is simple and may be carried out by relatively inexperienced operators, the ultimate findings depend on skilled technical preparation of serial sections and expert histological interpretation.

SUMMARY

A rectal suction biopsy tube developed specifically for taking rectal biopsies suitable for the diagnosis of Hirschsprung's disease, has been used successfully in 45 children of all ages, including the newborn. Two biopsies are taken at a level 3–4 cm. above the anal valves using a suction pressure of 20–25 inches Hg.

SUMMARIO IN INTERLINGUA

Un tubo de biopsia a suction rectal, disveloppate specificamente pro le obtention de biopsias rectal appropriate como material in le diagnose de morbo de Hirschsprung, esseva usate sin complication in 45 infantes e juveniles (representante un total de 116 specimens). Le methodo require le obtention de duo biopsias a un nivello de 3 a 4 cm supra le valvulas anal, con un pression de suction de 20 a 25 pollices Hg.

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