

Indigenous endoscopic accessories

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Single use of endoscopic accessories is becoming the norm in several countries. This increases the cost of therapy, making it unaffordable in developing countries where most endoscopic accessories need to be imported. There is thus a need to develop indigenous cost-effective endoscopic accessories in such countries. These accessories should not only be patient-friendly but should also be safe for the endoscopist as well as the endoscope. I have indigenized a few endoscopic accessories, using raw material like Teflon tubes, wires, three-way adaptor, silicon valve, and gadgets like drill machine, cutters, filers, sand papers, soldering iron, and adhesives.

Loop basket¹ (Fig 1-1)

This can be prepared by using 9F Teflon tube, stainless steel (SS) wire, nylon net, three-way adaptor and needles. An oval loop is made at the end of the wire and nylon net is sewn to make a loop basket, which is then taken into the Teflon tubing. This loop basket can be used for removing blunt foreign bodies. Sixty-four patients with ingested coins and other blunt foreign bodies underwent successful removal with this loop basket.

Metal-spring-tip guide wire (Fig 1-2)

This is a 2-meter-long SS wire of 1.25-mm thickness with 5-cm-long floppy SS spring tip. The spring tip and the wire can be joined with metal adhesive. Its tensile strength helps in providing a straight path to the dilator. The spring tip elasticity provides floppiness to the tip. More than 160 patients with esophageal strictures underwent approximately 5000 dilatation sessions using this wire.

The wire is safe and no related complication has occurred.

Achalasia dilator^{2,3,4} (Fig 1-3)

The preparation works on the principle of creating a pressure of 300 mmHg in an air-tight balloon while its volume is restricted to a desired limit by applying a nonexpansile covering. A nasogastric tube can be converted to double lumen by fixing a central tubing within it. One lumen is used for balloon inflation and the other is used to guide the dilator over a wire. The air-tight balloon is made from a condom and a covering strip at the center is made of silk cloth with maximum diameter of 3 cm, 3.5 cm or 4 cm as desired. This strip also helps in centering the dilator at the gastroesophageal junction during endoscopy-guided dilatation of achalasia cardia. The three radio-opaque markers at the ends and the center of the dilator (coated SS wires) help in fluoroscopy-assisted dilatation. Apart from these, the other material required are thread, latex tubing, silicon valve, and adhesive. The pneumatic dilator has been used successfully and safely in more than 140 patients in the last 10 years. Only one patient had esophageal perforation, which was treated conservatively.

Polypectomy snare (Fig 2-1)

This can be prepared by using a braided wire. A 2.5-cm-diameter oval shape is formed by giving certain angulations and applying a part of a needle pipe. At the other end a long needle is fixed. The assembly is then taken into a 9F Teflon tube and fixed to an indigenous handle at

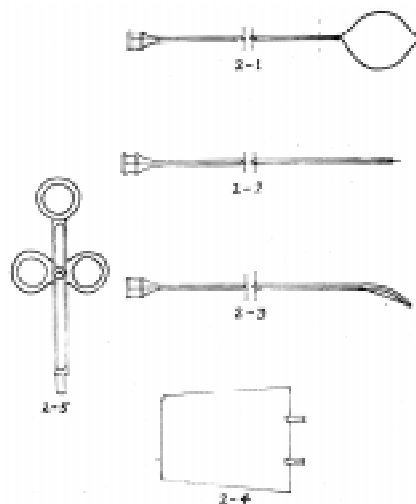
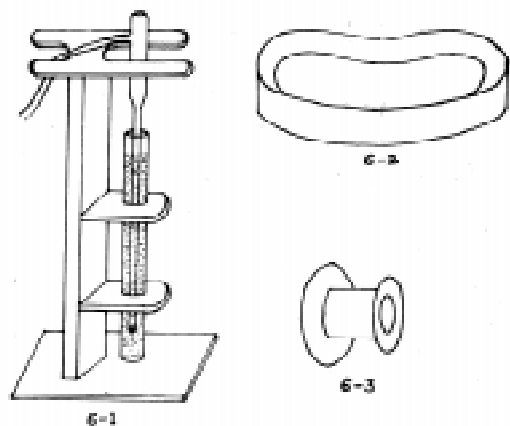


Fig 1: 1. Loop basket. 2. Metal spring tip guide wire. 3. Achalasia balloon dilator

Fig 2: 1. Polypectomy snare. 2. Needle knife sphincterotome. 3. Sphincterotome. 4. Earth plate. 5. Multipurpose handle

the other end. Thirty-two patients with polyps have undergone polypectomy successfully with this snare. Small-size snare is used to retrieve stents.

Needle-knife sphincterotome (Fig 2-2)

This can be prepared by using SS wires, needles, three-way adaptor, single-lumen 6F 180-cm-long Teflon tube, and an indigenous handle. A 30-cm-long thin (32G) SS wire and a 30-cm-long thick (26G) SS wire are joined together with a part of needle pipe and adhesive. At the end of the thick wire a long needle pipe is fixed. This wire is then taken into the Teflon tube and to the other end is applied a combination of three-way adaptor with silicon valve and an indigenous handle. This sphincterotome was used in 94 patients for precut sphincterotomy and in 16 patients with pancreatic pseudocyst for endoscopic cystogastrostomy.

Sphincterotome (Fig 2-3)

This is made of 6F single-lumen Teflon tubing, SS wire, long needle pipes, polycarbonate needle hub, indigenous handle, three-way adaptor, and silicon valve. It has a 5-cm cutting wire. It has a port for injecting contrast. A precut sphincterotome has a 1-mm short nose and a 5-mm convex oriented cutting wire. The precut sphincterotome was used safely in 35 patients. Multi-purpose indigenous handle prepared with molds is used for accessories requiring electric cautery (Fig 2-5).

Earth plate (Fig 2-4)

This can be prepared from an SS metal sheet of 45 cm length and 30 cm width. Two brass pins are welded to the sheet. This forms the male part of the two-pin electric plug. The female part is fixed to the wire of the cable of the electrocautery unit. It has the advantage of easy connection and can be repaired easily. A single earth plate was used for more than one year for cautery in nearly 400 cases.

Baskets (Fig 3-1)

These can be prepared by using a braided wire, part of needles, 6F and 9F Teflon tubes, adhesive, three-way adaptor, and silicon valve. Four wires 2.2 meters long are fixed to each other at one end; then all four wires are passed through a small needle pipe and fixed at 5.5 cm from the tip and given certain angulations to obtain a hexagonal shape. The other ends of the wires are fixed to a long needle pipe with adhesive; this assembly is passed through the Teflon tubing and to its other end is fixed a three-way adaptor with the silicon valve. Eighty-six patients with choledocholithiasis underwent endoscopic removal of stones of less than 1.5 cm size. The thin basket can be used to remove stones from the hepatic ducts.

Esophageal prosthesis (5 cm long, 10 mm width) (Fig 3-2)

These can be made from polyvinyl chloride (PVC) using

a mold. This is made radio-opaque by fixing plastic-coated SS wire in the grooves of the prosthesis.

Esophageal prosthesis introducer (Fig 3-3) is made of PVC. It is 50 cm long, with an outer diameter of 12 mm; one end is tapered by grinding. It is marked at 10-cm intervals. It is used to deploy the indigenous esophageal prosthesis.

Jejunostomy tube (50 cm length, 8 mm diameter) (Fig 3-4)

This is a silicon tube with three side-holes in the terminal 5 cm. The proximal end has a hub of polycarbonate for attachment of feeding syringe.

Percutaneous endoscopic gastrostomy tube (15 cm length, 8 mm width) (Fig 3-5)

This is made of silicon tube. To its one end an inverted silicon milk-feeding nipple is fixed with the help of silicon adhesive; at the other end is applied a plastic pipette tip with U-shaped plastic-coated thin SS wire. This can be deployed by endoscopic pull technique.

ERCP cannula (180 cm, 6F) (Fig 4-1)

This is prepared by tapering one end of a Teflon tube; to the other end a blunt needle is attached, and a three-way adaptor with a silicon valve is fixed to the needle end of the Teflon tubing. An SS wire of 26G, 100-cm length is fixed to the plastic cap of the three-way adaptor with the help of adhesive. This wire is put into the tubing across the three-way adaptor and fixed to it by screwing the plastic cap to it. The cannula was used in 80 patients for ERCP for diagnostic as well as wire-exchange procedures.

Biliary dilator (2 meters, 7F, radio-opaque Teflon tube) (Fig 4-2)

This is prepared by tapering the terminal 6 cm in a graded manner to 5F size. To the other end a needle hub

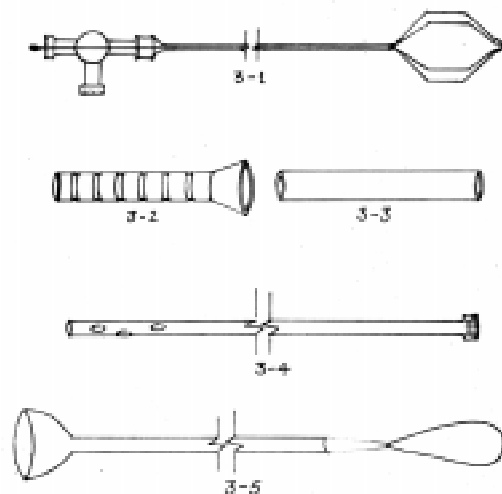


Fig 3: 1. Basket. 2. Esophageal prosthesis. 3. Esophageal prosthesis introducer. 4. Feeding jejunostomy tube. 5. Percutaneous endoscopic gastrostomy

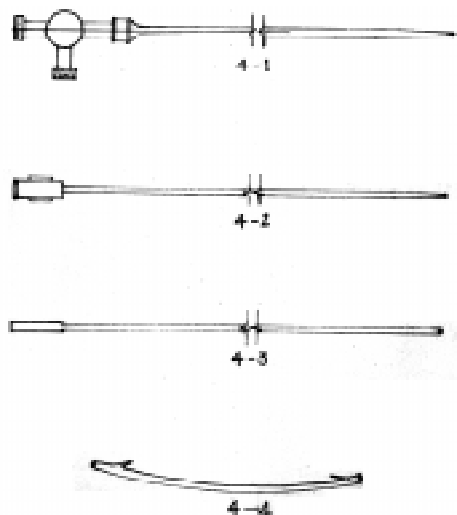


Fig 4: 1. ERCP cannula. 2. Biliary dilator. 3. Stent pusher. 4. Stent

with blunt end is fixed. The biliary dilator was used successfully in 60 patients with malignant biliary obstruction for dilatation of the stricture.

Straight stents (7F, 8.5F and 10F diameter) (Fig 4-3)

Such stents can be with Christmas tree pattern or with side flaps with or without side holes. They can be prepared from the radio-opaque Teflon tube. The proximal end is made rounded and tapering. One hundred and twenty-four patients with malignant biliary blocks, choledocholithiasis with cholangitis, post cholecystectomy bile leaks, and chronic pancreatitis with ductal stricture were managed using these stents.

Stent pusher (180 cm length) (Fig 4-4)

This is prepared from radio-opaque Teflon tube. At one end a 4-cm-long 10F Teflon tube is sleeved and fixed. The pusher can be used from either end to introduce 7F or 10F stents. The pusher has been used in 240 patients for pushing 7F stents into the biliary or pancreatic duct.

Injectors⁵ (Fig 5-1)

Injectors can be prepared by using Teflon tubing of 9F and 3F diameter. The needle of 1-cm length is fixed to 3F Teflon tubing to prepare thick- and thin-bore injectors. To the other end of the tubing is fixed a blunt needle of 21G size. To one end of the 9F Teflon tubing a blunt 14G needle is fixed. The assembly of the 3F Teflon tubing with the needle is sleeved through the 9F tubing. Once the injector is ready, only 0.5 cm of the needle should come out at the time of injection. Long injectors (180 cm) can be made for colonoscope to inject hemorrhoids or the base of polyps before polypectomy. An injector with a 1-cm-long 19G needle is useful in taking endoscopic needle aspiration cytology from tumors in the gut. These injectors have the advantage that they can be cleaned by removing the inner from the outer tubing. Fifty patients with gastric varices were

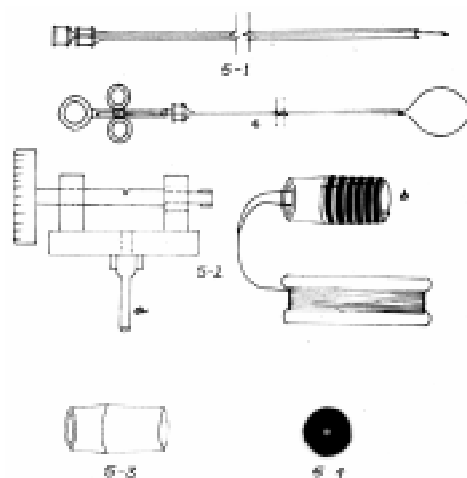


Fig 5: 1. Injector. 2. Ligator instrument (multishooter) (a) handle, (b) loaded cylinder, (c) thread retrieval snare. 3. Suction retrieval cylinder. 4 'O' ring

injected using 21G injectors; 110 patients with esophageal varices were injected using 24G injectors.

Ligators^{6,7,8} (Fig 5-2)

Single shoot ligator is prepared by mold forming the outer cylinder, inner cylinder with a lock for the trip wire, trip wire with a handle and band loader.⁷ The soft polyurethane cylinder is fixed to the proximal end of the outer cylinder. This instrument has the disadvantage of multiple introduction for each band ligation. The instrument was used in 120 patients with portal hypertension.

Multiband ligator can be prepared by preparing multiple parts of the instrument by molding. The parts include: the handle with one-way movement that is fixed to the accessory channel port of the endoscope, the cylinder with six preloaded bands and two threads with the beads at the terminal end that help to deload the bands during ligation. The thread retrieval snare is used to pull the thread through the suction channel for fixing it to the handle. The handle has a notch to which the knot of the terminal end of the thread is fixed. On rotating the handle the thread is pulled to a stage at which the ligation cylinder with 6 preloaded bands is fitted to the tip of the endoscope. During the procedure the thread is pulled by rotating the cylinder to deploy the band. This instrument has been used safely in 70 patients with portal hypertension.

'O' rings

These can be made from black rubber by the method of extrusion; they are useful for variceal ligation and hemorrhoids. More than 500 patients with portal hypertension had variceal ligation using these 'O' rings.

Suction retrieval cylinder⁹

This is the cylinder of the ligator. It is fixed to the tip of the endoscope. It removes blunt and lighter foreign bodies by applying suction after approximating the

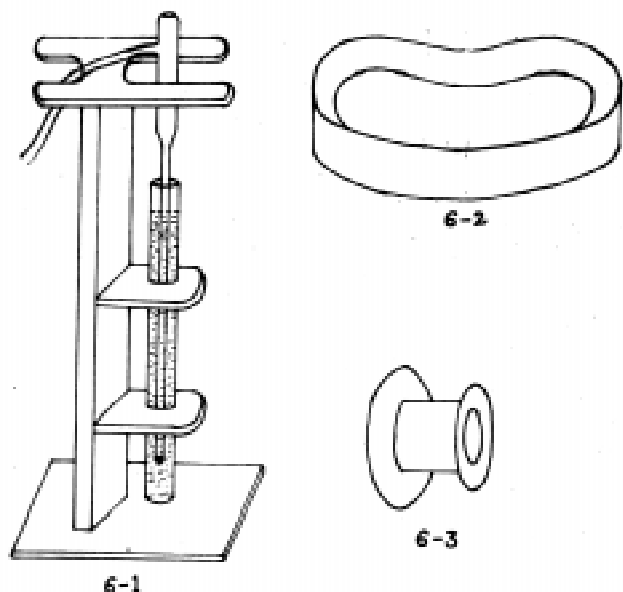


Fig 6: 1. Disinfectant endoscope and accessories container. 2. Disposable paper kidney tray. 3. Disposable wooden mouth guard

cylinder to it so as to create a vacuum between the tip of the endoscope and the foreign body. Thirty patients with food impaction have been treated successfully using this method.

Disinfection container¹⁰ (Fig 6-1)

This is a 130-cm-long and 3-cm-wide acrylic cylinder. The pipe is turned to a cylinder by applying a plastic disk at the end. A PVC tube (200 cm long, 1 cm diameter) is used to hold accessories for disinfection. Both these containers can be fixed to a wooden endoscope stand on which the endoscope and the accessories can be hung. A cylinder (7.5 cm diameter, 100 cm long) is fixed on the back of the endoscope stand for disinfection of dilators.

Disposable wooden *mouth guard* and disposable paper *kidney tray* can be prepared. Both these accessories are environmental friendly.

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