CASE PRESENTATION

Colon Interposition To The Esophagus

Dr. Hagop D. Yacoubian. *

Colon interposition to the esophagus is a useful surgical technique in cases where there is need to relieve an esophageal obstruction either as a definitive procedure or as a pallitive temporizing measure in inoperable carcinoma of the esophagus. The procedure, at times, has been called colon transplant to the esophagus. This is a misnomer since there is no total detachment and reimplantation of the colon. It is rather a mobilization of the colon, with its blood supply still intact and the terms "colon interposition to the esophagus" or "colon bypass of the esophagus" can be used interchangeably. Three cases have been handled by colon interposition at Salmaniya Medical Center recently. Following is a brief presentation of these cases.

CASE NO. 1

H.M.F. A 60 year old Bahraini, female, was admitted to Salmaniya Medical Center on December 2, 1979, with a two month history of progressive dysphagia and loss of weight. She had been treated for tuberculosis up to a year prior to admission but no other details were known. Chest film showed marked mediastinal shift to the left with marked collapse and fibrosis and cystic changes of the left lung. There was left pleural calcification. Few fibrotic changes were seen in the right apex (Figures 1a and 1b). A Barium Meal showed a long stricture involving the lower half of the thoracic esophagus (Figure lc).

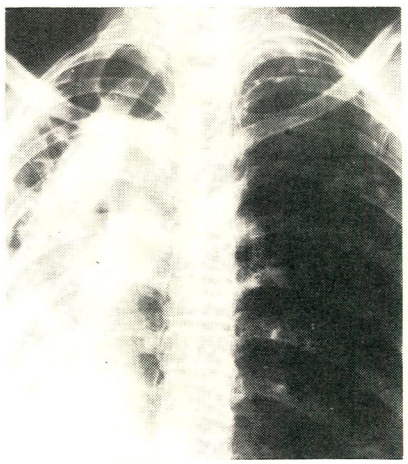
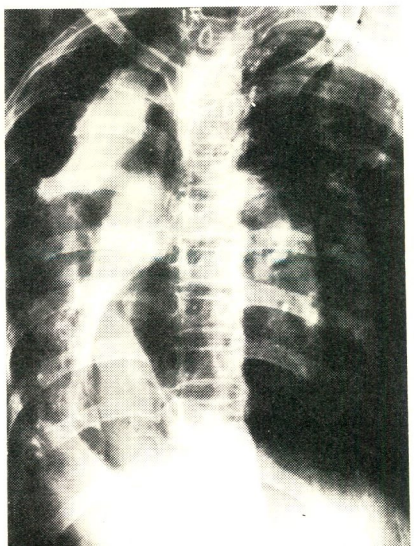


Fig. la : Case No. 1. Pre-operative Chest X-ray showing marked Mediastinal shift to the left, contracted left Lung, Cystic changes in the left Apex and residual Ribrotic changes in the right Apex.

Fig. 1b. Case No. 1. Oblique, penetrated Chest film showing extensive left Pleural Calcification.



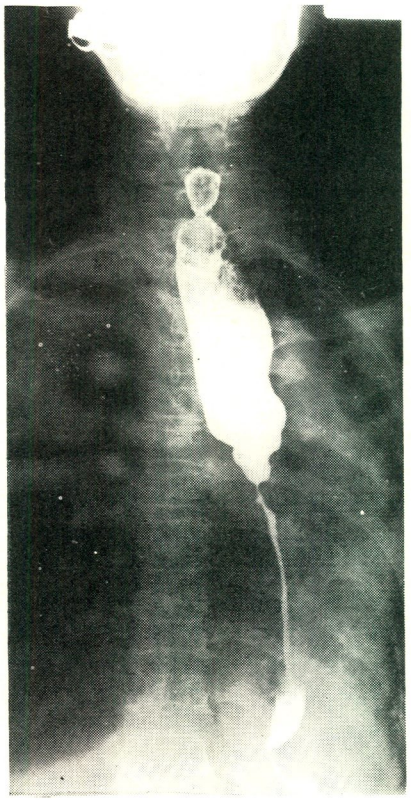


Fig. 1c. Case No. 1. Pre-operative Barium Swallow showing narrowing involving the lower half of the Thoracic Esophagus.

Broncoscopy revealed a tight stricture starting in the mid-esophagus that would not admit even a ureteral catheter. The mucosa was normal down to that point but could not be visualized beyond. Biopsy was reported as showing non-specific inflammation.

* From the Department of Surgery, Salmaniya Medical Center, Bahrain

On December 15, 1979, the right colon was mobilized retrosternally into the neck and a bypass was established between the cervical esophagus and the stomach. She did very well for seven days when a gastrograffin swallow was done which showed good passage with no leaks. She was started on oral intake. On the eighth post-operative day she complained of right pleuritic pain and in the next 24 hours there was evidence of right pleural fluid accumulation. A tube thoracotomy was done on the ninth post-operative day and one liter of blood tinged fluid was drained. A subdiaphragmatic exploration revealed no collection. She was transferred to the Intensive Care Unit for ventilatory support. On the eleventh post-operative day another right upper tube thoracotomy was performed and a pocket of pus was drained from the right pleural apex. The neck was explored at the same sitting and the anastomosis was found to be intact and well healed. She was unable to breathe on her own and gradually developed a right pulmonary infilrate associated with severe CO2 retention and hypoxemia. A tracheostomy was performed, but she died on the 30th post-operative day from pulmonary insufficiency. We feel the process in her right lung was either a resistant bacterial pneumonia or a tuberculous spread from the left lung. A pulmonary embolism was entertained. Acid fast culture results are not available at this time. Acid fast smears, however, were repeatedly negative.

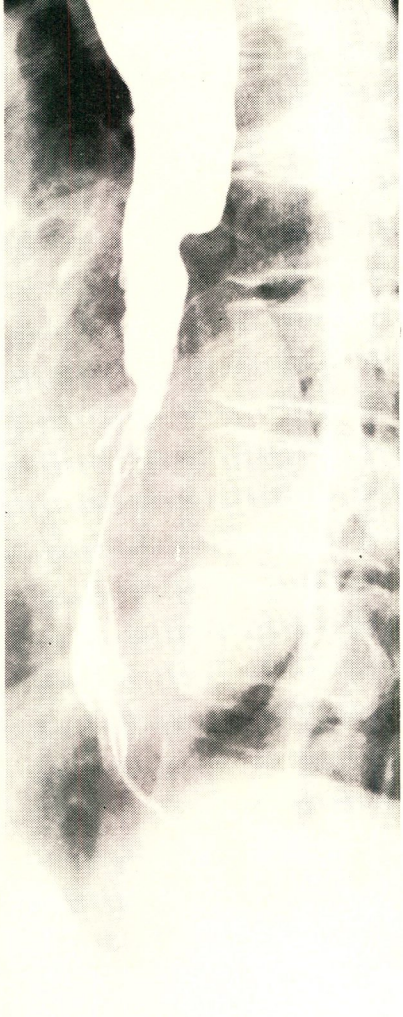


Fig. 2a Case No. 2. Pre-operative Barium Swallow showing narrowing in the mid Esophagus with proximal dilation.

Fig. 2b. Case No. 2. Post-operative Barium Swallow showing the patient Esophago-colostomy in the lower Neck.

Fig. 2c. Case No. 2. Post-operative Barium Swallow showing the patent Gastro-colostomy.

CASE NO 2

R.A.B. A 49 year old Bahraini woman had been treated for carcinoma of the esophagus by radiotherapy. She was admitted to Salmaniya Medical Center on December 19, 1979, with history of recurrent dysphagia of few months duration. On admission she was ematiated and looked dehydrated. There was no palpable lymphadenopathy. Liver was felt just below the costal margin. Barium Meal showed an 8cm long irregular narrowing in the middle third of the esophagus with slight proximal dilatation (Figure 2a). It was felt that this represented residual recurrent tumor with superimposed radiation stricture. On December 21, 1979, the left colon was mobilized and interposed retrosternally between the cervical esophagus and the stomach. The patient did extremely well. Gastrograffin swallow on the ninth post-operative day showed good passage and no anastomotic leaks. She was started on oral intake. She was discharged on the 13th post-operative day. On follow-up in the clinics, ten days later, she was doing well. Repeat Barium Meal showed patent anastomoses (Figures 2b and 2c).

CASE NO 3

K.Y.W. A 31 year old Lebanese woman had swallowed acid accidentally in 1965, at the age of 17. Two years later, she had a partial esophagectomy with esophagogastrostomy in a Beirut hospital. She came to the American University Hospital in 1972 with recurrent dysphagia and was found to have esophageal stricture above the esophagogastrostomy. She was reoperated, the anastomosis was separated, the stomach was reduced into the abdomen, the right colon was interposed between

the upper thoracic esophagus and the stomach. She did well but required periodic per oral dilatation of the esophago-colonic anastomosis.

In spring, 1977, she was readmitted to the American University Hospital with severe dysphagia and Barium Meal, at this time, showed obstruction at the colo-gastrostomy with marked dilatation of the interposed colon. The abdomen was re-explored, the colo-gastrostomy was excised, including more stomach, and a new colo-gastrostomy was performed with a small remnant of the gastric antrum. She developed recurrent dysphagia in 1978 due to stricture at the esophago-colostomy. A duodenostomy was performed and perodic retrograde dilatation were done until October 1979 at which time the patient came to Bahrain to seek further medical advice. Repeat Barium Meal showed a significant narrowing at the esophago-gastrostomy (Figure 3a). Passage into the stomach was normal. The patient was underweight, had symptoms suggestive of dumping syndrome, but otherwise was in good health.

Fig. 3a. Case No. 3. Pre-operative Barium Swallow showing the severe narrowing in the Esophago-colostomy in the upper Chest.

On November 24, 1979, a left thoracotomy was performed. The previous esophago-colostomy was easily identified. A tight submucosal circumferential band was found one centimeter above the anastomosis. A longitudinal incision was made across it and closed transversely (Mickulicz). In retrospect, we feel that the narrowing is due to a circumferential cicatrix in the esophageal wall secondary to the initial acid burn.

The patient did well post-operatively. On December 12, 1979, a laparatomy was done and the duodenostomy was closed under direct vision. Post-operative Barium Meal showed good passage with no narrowing (Figure 3b). She was discharged on December 19, 1979, to return to Lebanon.

Fig. 3b. Case No. 3. Post-operative Barium Meal showing good passage with a patent Esophago-colostomy.

Technique

Most of these patients are under-nourished, dehydrated, and are likely to have contracted blood volumes. It is necessary to hydrate them and build them up with transfusions prior to surgery. The patients' bowel must be prepared with oral neomycin for two days if the patient is able to swallow. Multiple daily enemas should be given for two days. If oral administration of neomycin is not possible, it is advisable to add neomycin to the enema fluid.

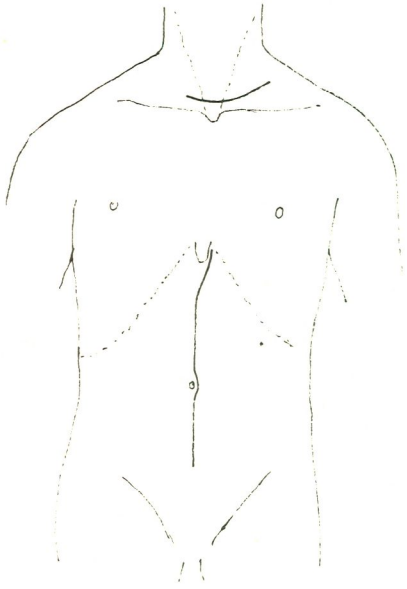


Fig. 4. Illustration showing the Abdominal and Neck incisions used for Retrosternal Esophago-gastric Colon Bypass.

Figure 4 illustrates the incisions used. A low thyroid incision extending more to the left and a generous midline abdominal incision extending up to the xyphoid process. Both right and left colon can be used. In either case the portion of the bowel used is hinged on the middle colic as its blood supply. The colon can be extended retrosternally to the neck for anastomosis with the cervical esophagus or into the right or left chest for anastomosis with the thoracic esophagus. The diagrams

illustrated in Figures 5 to 9 demonstrate the techniques involved in using the right and left colon with placement retrosternally or into the thoracic cavity.

Both right and left colon have their advantages and disadvantages. The right colon is isoperistaltic and easier to mobilize, on the other hand its lumen is wider than that of the esophagus and this may create difficulties when performing the esophago-colostomy. It is also shorter which may necessitate using the terminal ileum for anastomosis with the esophagus. The retention of the ileo-colic junction and its possible competence may create difficulties during belching and vomiting. The left colon is longer and will easily reach the neck; its caliber is more comparable to that of the esophagus and it has been stated that its vascular arcade is more constant. The fact that it is placed in an antiperistaltic fashion may be a disadvantage though there is no real evidence to corroborate this.

Regardless of which side of the colon is used it is of vital importance that the division of the vessels be carried out proximal to their bifurcation as illustrated. Failure to do so will invite catastrophy. It has been our practice to divide the peritoneal reflections of the bowel in preparation for mobilization and to temporarily occlude the vessels to be divided as well as the bowel

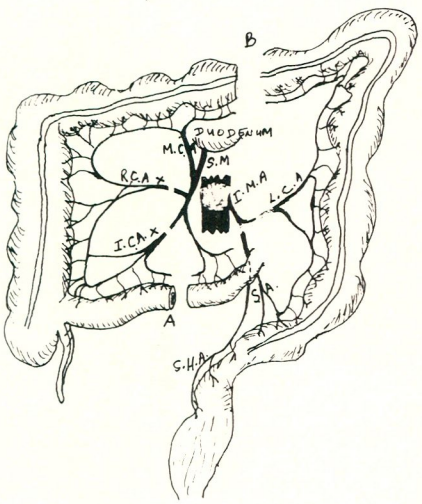


Fig. 5. This figure illustrates the use of the right Colon. The Ileum is divided at point "A" and the Transverse Colon at point "B" Distal to the middle Colic Artery (MCA). It is important to divide the right Colic Artery (RCA)) and the Ileo-colic Artery (ICA) at the points marked by X's to insure a patent Vascular Arcade. Division beyond the bifurcations would interrupt the Arcade and cause distal slough of the bowel to be interposed. The mobilized portion of the bowel has been shaded in dark.

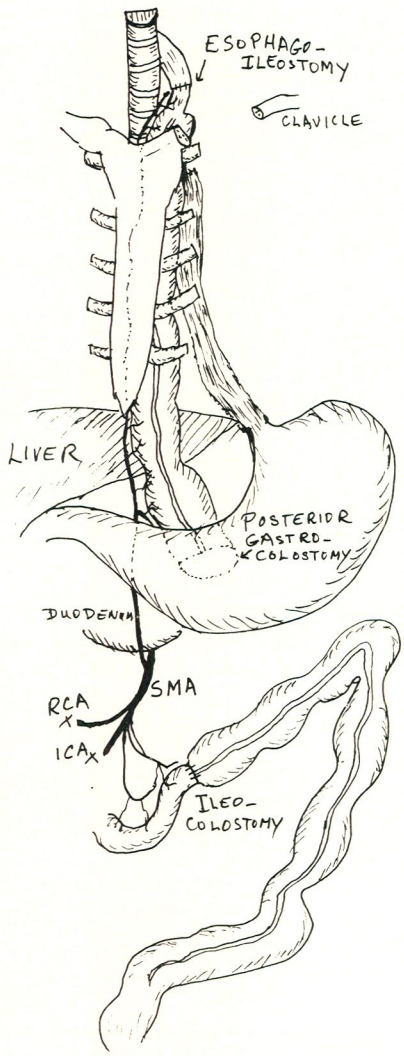


Fig. 6. The mobilized right colon as it was used in case No. 1. The bowel is extended upwards behind the stomach, anterior to the left Lobe of the Liver, retrosternally to the neck. An end-to-end Anastomosis has been performed between the Ileum and the Proximal end of the divided Cervical Esophagus. The Distal Esophagus is closed. A posterior Gastro-colostomy has been performed. The proximal Ileum is joined, end-to-end, to the distal transverse colon to re-establish continuity of the G.I. Tract. The head of the left Clavicle has been excised.

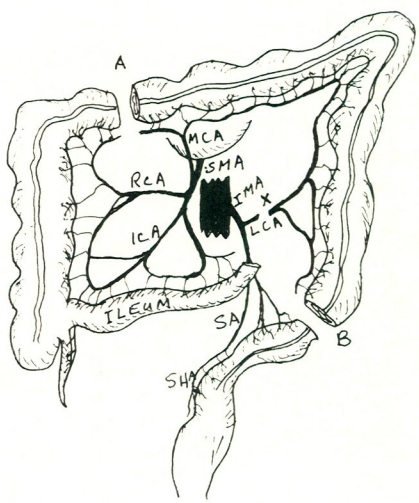


Fig. 7. Illustration of use of the left Colon. The Transverse Colon has been divided proximal to the middle Colic Artery at "A" and just proximal to the Sigmoid Colon at "B". Note that the left Colic Artery has been divided proximal to its bifurcation for reasons indicated earlier. For abbreviations refer to legend of fig. 5. The mobilized portion of the colon has been shaded dark.

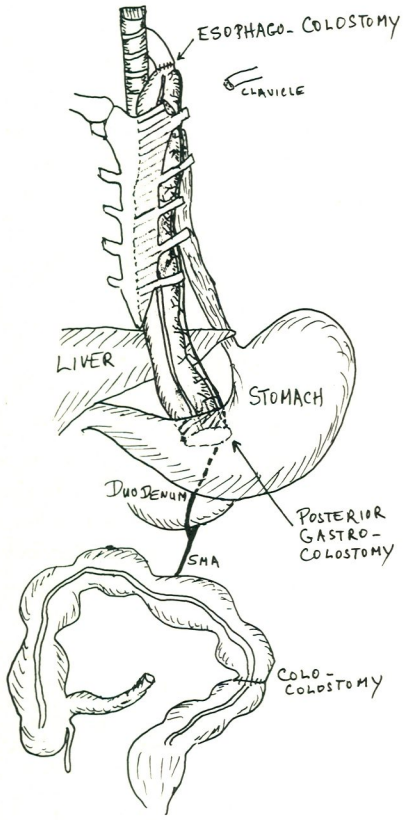
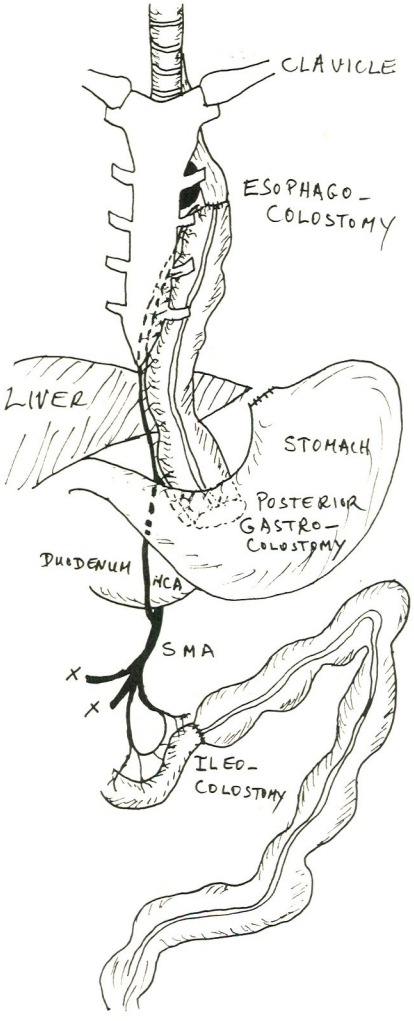


Fig. 8. The mobilized left colon as it was used in case No. 2. The bowel has been extended into the neck in a fashion similar to that in fig. 6 with a proximal Esophago-colostomy and a Posterior Colo-gastrostomy. The proximal Transverse Colon and Sigmoid Colon have been joined to re-establish colonic continuity.

and mesentary outside the points of eventual separation and then watch the color of the bowel for about five minutes while it is being supplied solely by the middle colic artery. Visible pulsation at points most distal from the middle colic artery indicates adequate blood supply. Actual divisions are carried out after such an inspection.

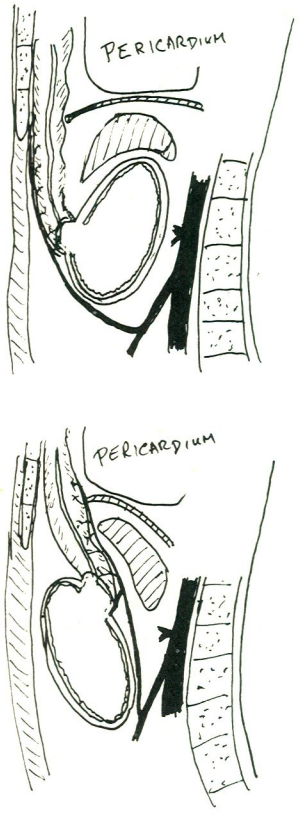
The colon must always be extended upwards behind the stomach to prevent stretching of the middle colic artery with gastric distention (Figure 10). The anastomosis with the stomach must be made high on the posterior surface. The retrosternal tunnel must be wide so that it will accomodate the colon easily. This necessitates detachment of the diaphragmatic attachments to the sternum and costal cartilages on both sides and division of the sternothyroid and sternohyoid muscles at their attachment to the thoracic inlet. In practice, we ascertain adequacy of the tunnel by passing the hand

Fig. 9. The mobilized right Colon as it was used in case No. 3. The Colon has been extended into the left Hemithorax and an Anastomosis has been performed between the upper Thoracic Esophagus and the Colon. The remainder of the Esophagus has been removed. The rest of the procedure is similar to that in the Case No. 1(Fig. 6).



retrosternally from above and below, hugging the posterior surface of the sternum closely. With care, puncture of the pleurae and damage to the innominate veins

Fig. 10. Illustration showing the relationship of the stomach to the middle Colic Artery in Anterior and Posterior placement of the Colon. It is easy to see how Gastric Distension can cause arterial compression in Anterior placement.



can be easily avoided. In the lower neck the esophagus is located slighly to the left of the midline, it is therefore easier to mobilize it from the left side between the trachea and the carotid sheath. Care must be taken to preserve the left recurrent nerve and the thoracic duct. The esophagus is divided, the distal end is closed and a two layer esophago-colostomy is performed using non-absorbable, fine, interrupted sutures. It is advisable to divide the left sternocleidomastoid muscle permanently and remove the head of the clavicle to avoid pressure on the colon and anas-

tomosis. It is not advisable to pass a naso-gastric tube through the colon, into the stomach. Instead, a gastrostomy is established for post-operative decompression and for feeding if necessary.

After bowel continuity is restored, the mesentary should be carefully closed to avoid internal herniation. It probably is not necessary to perform pyloroplasty and vagotomy; the colon seems to be resistent to gastric acid and enzymes. If the ileum has to be retained, the appendix must, of course, be removed. A drain is left in the neck incision as a protection against anastomotic leak. The abdomen is closed without drainage.

On the fifth or sixth post-operative day a gastrograffin swallow is done to document anastomotic patency and absence of leaks. Following this, oral intake can be started gradually. By the tenth day it should be possible to remove the gastrostomy tube unless complications require its presence for feeding purposes.

DISCUSSION

There are a number of diseases of the esophagus which can cause serious dysphagia due to persistent obstruction. If unrelieved, dehydration, inanition, aspiration pneumonia and death will inevitably follow. Among the common causes are malignant obstruction, stricture following irradation for malignancy and chemical burns with stricture. Less common causes are peptic esophagitis with stricture, advanced decompensated achalasia (Megaesophagus) and complicated or extensive congenital atresia. Colon interposition has something to offer in all these situations.

Surgery in carcinoma of the esophagus is a pallitive procedure since five year survival is extremely rare. In most cases of middle and lower esophageal carcinoma, the procedure of choice is standard esophagectomy with esophagogastrostomy. It is indicated whenever the tumor is technically resectable, unless the patient has wide spread metastases and a short life expectancy. This will effectively relieve the dysphagia and prevent pulmonary complications. The patient will live a relatively comfortable life and succumb to disseminated disease before any complications from reflux esophagitis set in. There are situations, however, where the tumor is technically not resectable because of local invasion, or the tumor is too high for safe resection or, the patient having received radiation, stricture develops. In the latter condition a direct attack on the irradiated esophagus is risky because of the high incidence of anastomotic breakdown. In all of these situations colon bypass can offer gratifying symptomatic palliation with acceptable risk assuming of course that the general condition of the patient and life expectancy are reasonably good.

Benign esophageal conditions represent the best indications for colon interposition. One is dealing, in these patients, with a normal life expectancy. Esophagectomy with esophagogastrostomy will eventually and invariably lead to esophagitis, ulceration and stricture and is therfore a very unsatisfactory procedure for long term relief. The lnitial efforts at esophageal reconstruction consisted of the creation of a subcutaneous skin tube between the cervical esophagus and the stomach. These were long, tedious procedures requiring multiple operations and were fraught with pitfalls. Construction of gastric tubes were equally unsatisfactory.

Bowel interposition seems to offer the best solution. By keeping its blood supply intact, a segment of bowel can be interposed in the esophagus or between it and the stomach. The small bowel is one possibility that suffers from serious shortcomings. The vascular arcade is significantly shorter than the corresponding bowel making it impossible to take advantage of the full length of the bowel. Furthermore small bowel mucosa is susceptible to gastric secretions and there is a high incidence of stomal ulceration at the gastro-enterostomy.

The colon has the remarkable feature of being resistant to gastric acidity and peptic erosion has therefore not been a problem. Its other advantage lies in the fact that its vascular arcade is practically of the same length as the bowel enabling one to make full use of the bowel length without undue stretching of its vessels. The fact that either the right or left colon can be used is an added bonus in situations where one side is not suitable for unrelated reasons.

In general, retrosternal placement with anastomosis to the cervical esophagus is preferable. The procedure is simpler, a thoracotomy is avoided and any proximal anastomotic leak will simply result in a cervical abscess requiring no more than drainage. Intrathoracic interposition, for low esophageal lesions, has the advantage of requiring mobilization of shorter segments of colon. Proximal anastomotic leak, however, carries the much higher morbidity and mortality associated with mediastinitis and pleural empyema.

The three cases presented here illustrate some of the indications for colon interposition; inflammatory stricture, lye stricture, and radiation stricture. They also illustrate most of the methods possible; retrosternal right colonic placement, retrosternal left colonic

placement and intrathoracic right colonic placement.

The overall mortality is about 15 percent but this figure includes patients with invasive carcinomas and those who have undergone radiation for malignancy. When the younger group of patients with benign conditions are taken separately, mortality is much lower and should not be more than five percent.

The most common complication is related to distal slough and anastomotic breakdown in the neck. This is not surprising since ischemia is likeliest at points furthest away from the blood supply.

SUMMARY

Colon interposition to the esophagus is a useful procedure in selected cases of esophageal obstruction. It offers valuable palliation in cancer of the esophagus not amenable to conventional surgical management. It is the ideal procedure for benign strictures of the esophagus where it is expected to give permanent relief compatible with long life. Though the procedure is long and of great magnitude, with careful attention to detail, mortality should be quite low.

REFERENCES

1. Heimlieh, H.I. : Esophagitis. Complications treated by total bypass without esophageal resection. Ann. Thorac. Surg., 10 : 203-212, 1970.

2. Postlethwait, R.W., Sealy, W.C., Dillon, M.L., et al. : Colon Inter position for esophogeal substitution. Ann. Thorac. Surg., 12 : 89 — 109, 1971.

3. Wilkins, E.W., and Burke, J.F.: Experience with the colon esophageal bypass. Presented before the New England Surgin7aeaeto27, 1974. □□

H.E. The Heir Apparent and Commander-in-Chief of The Bahrain Defence Force Shaikh Hamad Bin Isa Al-Khalifa opening the Isa Town Health Centre on June 10th, 1980.