

**THE LATE RESULTS OF PORTO-AZYGOS DISCONNEXION IN
THE TREATMENT OF BLEEDING FROM OESOPHAGEAL
VARICES**

Hunterian Lecture delivered at the Royal College of Surgeons of England
on

12th May 1960

by

Norman C. Tanner, M.D., F.R.C.S.

Consultant Surgeon, Charing Cross Hospital; Surgeon, St. James' Hospital

IN 1950, I mentioned during a discussion, which was published, an operation that I had used since 1948 in the treatment of bleeding from oesophageal varices. Because of the short period which had elapsed since the first operation I could not judge its merits, but now, ten years later, it is time to try to do so.

By 1950 we had begun to establish that a porto-caval anastomosis and to a lesser degree a spleno-renal anastomosis, carried out between episodes of bleeding, offered good protection against recurrent bleeding. We were, however, concerned as to its possible effects on liver function and because it led to an increase in portal systemic encephalopathy, the so-called "nitrogen intoxication".

Because of these cerebral changes, because a shunt is unsuitable for active bleeding and because there were many cases in which a shunt was impracticable, it seemed that a further study of direct operations on oesophageal varices should be made. It was obviously desirable to evolve a method which would not only arrest bleeding in the acute phase but also give reasonable protection against future haemorrhage.

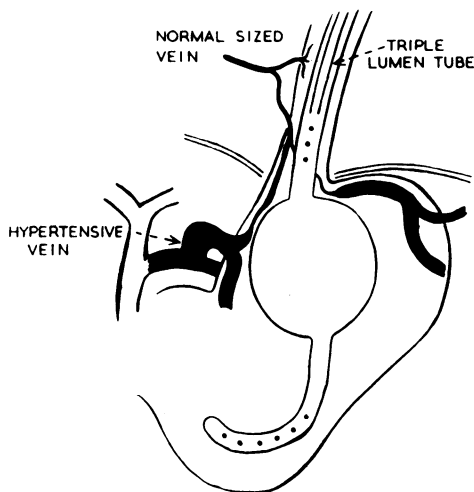
Past operations to stem acute bleeding had not been graced with much success. Splenectomy, ligation of the splenic or hepatic artery, or of the coronary veins, had been found ineffective or dangerous. More recently, Boerema (1949) and Crile (1953) had suggested and practised ligation of lengths of the oesophageal veins, after making a short incision in the oesophagus from a transthoracic approach. While this operation appeared to be effective in stopping bleeding temporarily, it was generally found that bleeding recurred after an interval of weeks or months (Linton, 1953).

Direct interval operations to prevent recurrent bleeding had also met with little success. I had tried and abandoned injection in or around the varices with a sclerosing solution via an oesophagoscope. The most successful operation up to that date was undoubtedly gastro-oesophageal resection, as recommended by Phemister and Humphries (1947). This

NORMAN C. TANNER

was generally deemed to be too major a procedure to use as an emergency operation, but certainly had, and retains, an important place in dealing with the interval case.

It occurred to me that an operation analagous to the Trendelenberg operation for internal saphenous varicosities might be attempted. In the case of the internal saphenous vein, the vein is ligatured at its junction with the femoral vein, the motive being to interrupt the gravitational and intra-abdominal pressures exerted on the saphenous vein. In the case of oesophageal varices, the interruption would have to be between the oesophageal and the portal venous systems, for it is the increased pressure in



Reproduced by permission

Fig. 1. When traction is made on the intragastric balloon, the veins round the cardia are compressed between the balloon and the diaphragm. (From *Chirurgische Praxis* (1959) p. 169.)

the portal system which leads, not only to an increased *pressure* in the oesophageal veins, but also to vastly increased and so far unmeasured *volume* of blood flow through them escaping from the portal to the azygos and other systemic veins. Here the analogy between the two veins breaks down for the *volume of flow* in the varicose saphenous vein is slight.

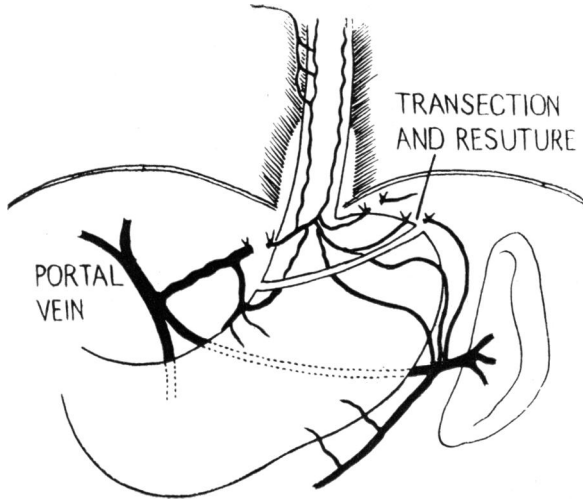
Evidence that an interruption such as I had visualized might be of value was provided by the use of the gastric balloon in oesophageal bleeding. There is abundant clinical evidence that traction on an intragastric balloon stops bleeding from oesophageal varices. It is true that many models used in this condition have two balloons and the upper one, usually cylindrical in shape, is designed to press directly on the varices.

PORTO-AZYGOS DISCONNEXION IN THE TREATMENT OF BLEEDING

Nevertheless, it is the lower balloon which is the main factor in stemming the bleeding. When traction is made on it, the cardiac end of the stomach is compressed between the diaphragm and the balloon, so compressing the veins around the cardia (Fig. 1). This is in fact a form of porto-azygos venous interruption and I tried to reproduce this state of affairs surgically.

Operations to produce interruption of the collateral circulation of the oesophagus

Because the decision that bleeding from oesophageal varices was occasionally made during a laparotomy, the first operation devised was



Reproduced by permission

Fig. 2. Diagram of subcardiac porto-azygos disconnection. (From *Medical Press* (1956) 236, 36.)

one which would be carried out by an abdominal route. I described it as follows at a meeting of the Surgical Section of the Royal Society of Medicine (Tanner, 1950):

“ Peri-oesophageal venous transection alone is inadequate. It is necessary that the emergency operation be one which can be performed by an upper abdominal incision, such as that used in exploring a case of haematemesis of unknown origin. Therefore I suggest (1) gastric transection and resuture to interrupt the venous circulation in the stomach; (2) division of all the vasa brevia to the upper part. This entails lifting the stomach forward after transection and dividing the occasional vasa brevia which run up the posterior wall of the lesser sac from the splenic trunk; (3) division of the left gastric pedicle, carefully sparing only the left gastric artery, in order to preserve a blood supply to the cardiac end of the stomach, but, of course, dividing the descending branch of the left gastric artery. Thereby there is complete division between the portal and azygos circulations.”

However, at a later meeting of the same Society in 1954 I was able to report certain deficiencies in this operation as follows (Tanner, 1954):

“ Unfortunately, some 3 or 4 of the cases eventually bled again. It was found by post-mortem vein injection methods that there was no appreciable flow across the gastric suture line eighteen months after transection and resuture, but venous connexions between the oesophageal veins and inferior phrenic veins around the cardia kept the pressure up in the varices, presumably because the inferior phrenic veins had become hypertensive. Therefore I modified the operation and since 1951 have carried out what is now a subcardiac porto-azygos disconnexion as follows: By an abdomino-thoracic approach the lower 5 cm. of oesophagus, the cardia, and upper 5 cm. of greater and lesser curve of stomach are entirely freed from all external vascular connexions. The stomach is then completely transected 5 cm. below the cardia and firmly resutured (Fig. 2). There is just enough blood supply from the oesophagus to nourish the small upper gastric segment. An attempt is made to preserve the hepatic branch of the anterior, and coeliac branch of the posterior vagus, but if the vagus has to be completely severed I add a Rammstedt type of pylorotomy.”

It was obvious that my first operation was not in fact a complete porto-azygos disconnexion, and apart from the possibility I mentioned, that the inferior phrenic veins might have become hypertensive, there was also the possibility that oesophageal venous hypertension may have been maintained by small accessory gastric veins running directly from the cardiac end of the stomach to the hilum of the liver.

THE TECHNIQUE OF SUBCARDIAC PORTO-AZYGOS DISCONNEXION

I think it is important to describe the operative technique. Some surgeons have over-simplified a very difficult situation and have merely divided and resutured the stomach. Such a procedure would have only a temporary effect in diminishing the volume of blood through the oesophageal veins, and would probably not lower the *pressure* inside the oesophageal veins at all.

The operation is most easily carried out through an abdomino-thoracic incision, removing the ninth rib. The diaphragm need not be completely divided to the oesophageal hiatus, but complete division does make the operation easier. An abdominal approach is possible, but difficult if the liver is very large or very hard. In cases of extrahepatic portal hypertension, however, where the liver is normal, and particularly if the patient is slender, an abdominal approach is not so difficult. If such an approach is used it is best to remove the xiphoid process, and I have at times also split the lower half of the sternum. The left triangular ligament of the liver will have to be divided and the left lobe deflected to the right. An incision is made transversely through the phreno-oesophageal ligament and then a small incision made in the anterior margin of the oesophageal hiatus in the diaphragm, in order to expose the lower oesophagus.

The first step in the operation will be to free the greater and lesser curvatures of the upper 8 cm. of the stomach (Fig. 3). Whereas this may

PORTO-AZYGOS DISCONNECTION IN THE TREATMENT OF BLEEDING

be a matter of the greatest simplicity in a carcinoma case, in cases of portal hypertension the intense vascularization of the region, with oedema and thickening of the mesenteries and the close proximity of an enlarged spleen, may render it a slow and difficult dissection. If, as is sometimes the case, the spleen has been removed at a previous operation, then the dissection of the stomach from its vascularized adhesions to the diaphragm may be even more laborious. There are two methods of dealing with the upper lesser curvature. The first is to divide the lesser omentum up to the cardia (which involves division of the hepatic branch of the anterior gastric nerve), followed by ligature and division of the left gastric pedicle. This will include division of the left gastric artery, vein, lymphatics, the coeliac branch of the posterior gastric nerve and many

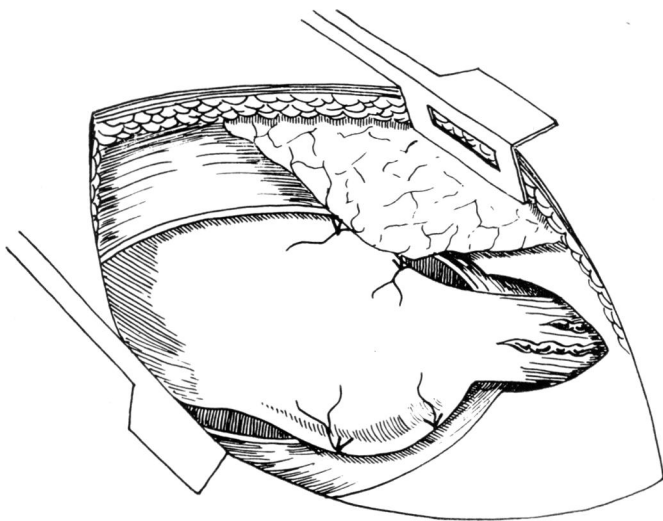


Fig. 3. Through an abdomino-thoracic incision the lower oesophagus, cardia and upper stomach are freed of all vascular or ligamentous connections.

sympathetic nerve fibres. This makes the stomach very free and easy to manipulate, and is probably the best method in the less vascular cases. A method which may be easier when the stomach is adherent or excessively vascular is to dissect close to the muscular wall of the lesser curve, making a division between the muscle wall of the stomach and the tissue in which the ascending branch of the left gastric artery runs. This will involve meticulous dissection, with double ligature and division of the branches of the left gastric artery and vein just as they enter the stomach. This dissection must extend round the cardia, and up the oesophagus for some 6 cm. above the cardia. In most cases the vagus nerves are divided, though I have spared the coeliac branch at times. A notable vein may be seen to be running with the coeliac nerve in some cases.

Having freed the lower oesophagus, the cardia and the upper stomach from all vascular or other external connections, the stomach is clamped in two Payr clamps 5 cm. below the cardia, and the stomach divided between the clamps (Fig. 4). The distance of 5 cm. is measured from the cardia down the lesser and greater curvatures of the stomach and is chosen as being certain to be below the sometimes bulbous lower ends of the oesophageal varices. It is a length which I have found by experience to be safe to leave, and apparently just enough blood comes through the isolated oesophagus to nourish it.

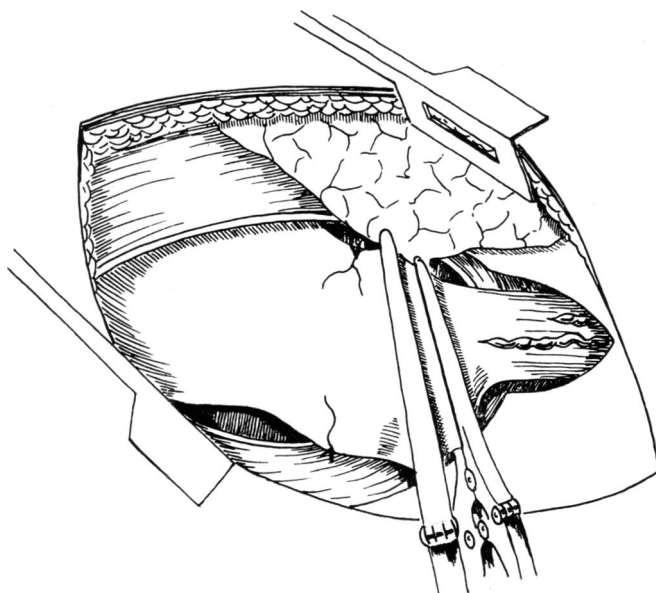


Fig. 4. The stomach is clamped with Payr crushing clamps 5 cm. below the cardiac orifice of the stomach, and divided between them.

All that now remains is to anastomose the divided ends of stomach. In practice this is a little difficult because it will be found that the upper cut end is much shorter than the lower one. An additional difficulty is that the lower cut end is not very mobile as a result of the limited freeing of the lesser curvature which may have been carried out. A simple method of overcoming both of these difficulties is to close the lesser curve part of the lower incision (Fig. 5) and to anastomose the upper end to the outer two thirds of the lower end, which will then be found to have become more mobile and of a more suitable length (Fig. 6). Because the viability of the upper gastric segment must be diminished, it is well to suture the two in such a way that the upper segment is almost buried under the lower segment (Fig. 7).

PORTO-AZYGOS DISCONNEXION IN THE TREATMENT OF BLEEDING

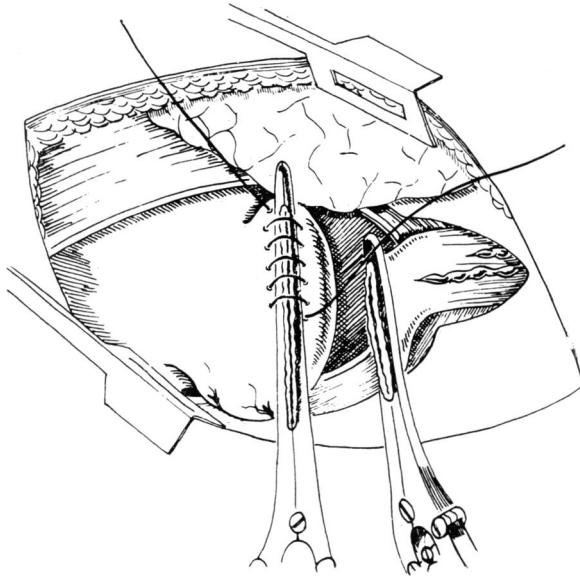


Fig. 5. The medial part of the lower cut end of the stomach is closed with two layers of catgut.

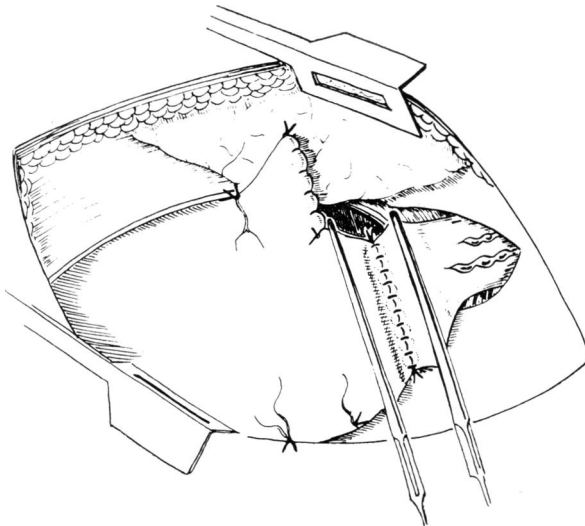


Fig. 6. The remaining open ends of the stomach will now be of similar width and more mobile. A two-layer catgut anastomosis is carried out between them.

NORMAN C. TANNER

Following this a pyloroplasty or gastro-jejunostomy may be carried out and the diaphragm and wound repaired. If the pleural cavity has been opened a chest drain is inserted.

COMPLICATIONS

The degree of disturbance to the patient will depend on his state at the time of operation. Many are acutely bleeding or anaemic, and worse still some are suffering from the effects of blood inhalation and pneumonia, or of ammonia intoxication from the presence of blood in the intestine. For the interval case the amount of blood lost during the operation will be the

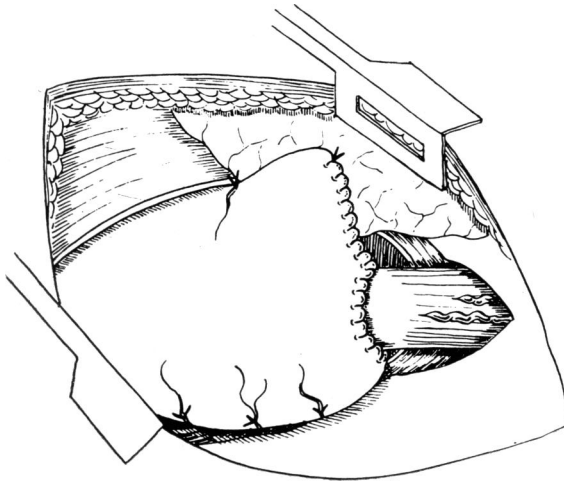


Fig. 7. When the anastomosis is complete, the upper gastric segment is almost buried under the lower one.

main disturbing factor and it is very important to replace any blood as rapidly as it is lost.

Vagotomy symptoms

Because the vagus nerve fibres running through the stomach and into the lesser omentum are divided, severe delay in gastric emptying may occur.

R. P., age 12, was admitted to St. James' Hospital in January 1956 with a history of repeated haematemesis. He had had a splenectomy at the age of 3, and at the age of 6 a laparotomy had disclosed a cavernoma of the portal vein. On 30th January 1956, the fourth day of bleeding, I operated on him and carried out a subcardiac porto-azygos disconnexion. Following this the bleeding ceased, but he developed severe delay in gastric emptying with bouts of vomiting. This persisted for seven weeks, and so at the end of this time a laparotomy was carried out and a pyloroplasty made. He was discharged three weeks later and since then has been well with no further bleeding.

PORTO-AZYGOS DISCONNEXION IN THE TREATMENT OF BLEEDING

Most patients, aided by a few days' decompression by a gastric tube, have regained their normal emptying rate and no gastric drainage procedure has been necessary. In many interval cases, however, provided the patient is reasonably fit by the time the disconnexion is completed, a Rammstedt pylorotomy, a Heineke Mikulicz pyloroplasty, or a gastro-jejunosotomy is carried out to prevent this complication.

Ascites

Because an important collateral circulation has been divided, ascites might be expected to occur. In practice mild degrees of ascites have

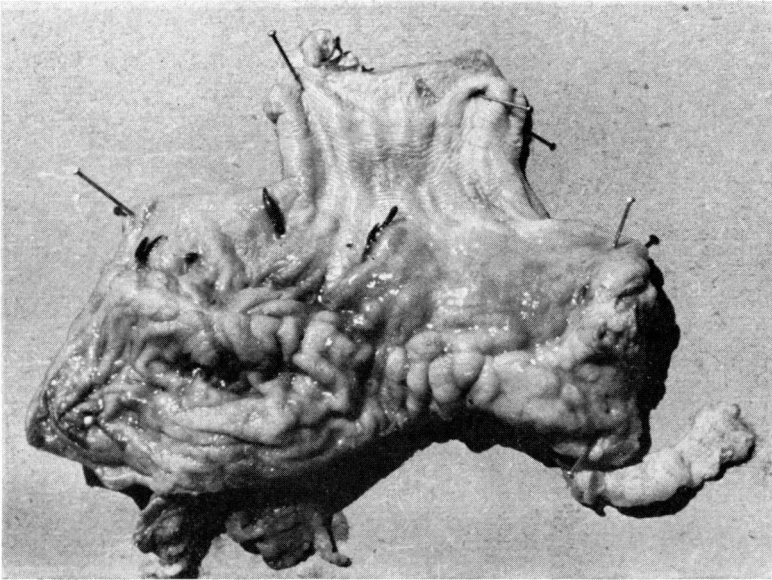


Fig. 8. *Case of S. O'C.* Persistence of non-absorbable sutures in the gastro-gastric suture line 19 months after disconnexion, leading to recurrent bleeding.

occurred or persisted, but have usually cleared up once adequate feeding was re-established except in those cases where ascites was troublesome prior to the operation.

Reflux

As a result of the damage to the phreno-oesophageal ligaments and to the margins of the oesophageal hiatus in the diaphragm caused by this operation, one might expect reflux of gastric juice and heartburn to follow. Heartburn is occasionally complained of and it is possible that a reflux oesophagitis may in part account for some of the cases of milder bleeding that have occurred after porto-azygos disconnexion.

Ulcers due to the use of non-absorbable suture material

In some of the earlier cases, in an endeavour to discourage the development of a collateral circulation across the gastric suture line, fine silk or thread was used as a firm continuous suture on the inner layer of the anastomosis. Now in 1951 (Tanner, 1951) I recorded a series of cases in which ulceration occurred months or even years after gastrectomy, as a result of using continuous fine non-absorbable suture material on the mucosa, the ulcers appearing at the site of the knot and leading to severe bleeding. Indeed I went to the length of adapting my gastroscope with an instrument to extract silk knots from the stomach. It is therefore not surprising that some of the disconnexion cases also developed silk ulcers.

S. O'C., aged 23, a nurse, was admitted in September 1952 with massive and repeated haematemesis and melaena. A splenectomy had been carried out on her at another hospital when she was 18. She had severe oesophageal varices. On 9th September 1952 a subcardiac porto-azygos disconnexion was carried out. She was well for 19 months and then had a moderate-sized haematemesis. She was re-explored in June 1954. There was cavernomatous replacement of the portal vein. A resection of the upper stomach and lower oesophagus was therefore carried out and an end-to-end anastomosis made. The specimen showed the presence of persisting silk sutures projecting into the stomach (Fig. 8). The varices were barely noticeable.

Following this the patient has married, had a child, and has no disability beyond occasional slight heartburn.

Since then we have therefore made the anastomosis using two layers of chromic catgut.

Gastric ulcer possibly due to gastric retention

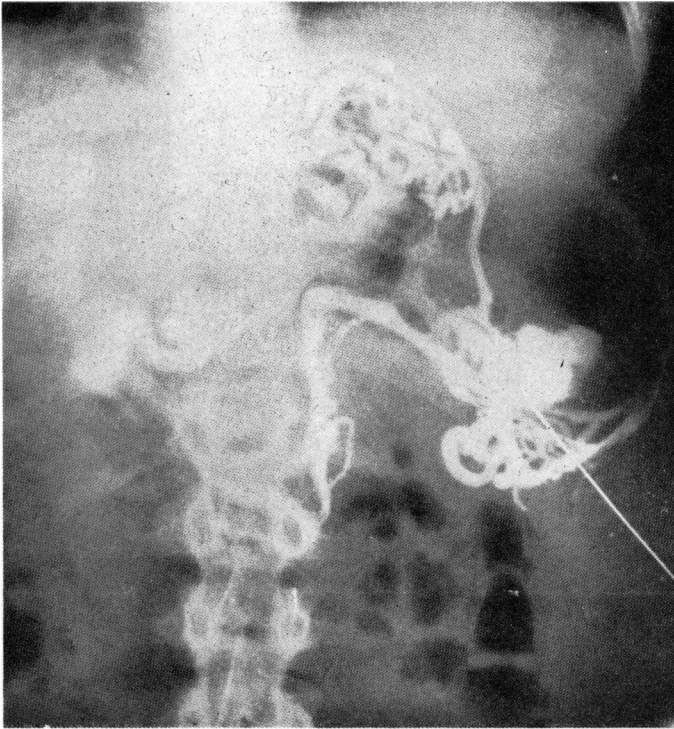
One fatal haemorrhage came into this category.

E. N. M., aged 64, was admitted to St. James' Hospital in May 1952 with a history of three severe haematemeses in eighteen months due to cirrhosis of the liver with oesophageal varices. On 15th May 1952 I carried out a subcardiac porto-azygos disconnexion. Following this the oesophageal varices were seen to be less prominent and less congested. A year later she had had no further bleeding but it was noted that she had gross gastric retention. In September 1953 she had a severe haemorrhage and died in another hospital. At the autopsy it was found that she had four ulcers in the stomach, all on the gastro-gastric suture line.

Collateral circulation across the suture line

It was thought that the porto-azygos disconnexion as described might be limited in its effects by the development of a collateral circulation across the gastro-gastric suture line. This has proved to be the least well founded of our worries.

In patients dying one or more years after operation, no appreciable growth of new vessels across the suture line is seen microscopically or macroscopically, nor can any be found by injection of dye. Gastroscopic examination one or more years after operation also shows no evidence of any visible submucosal vessels on or near the suture line.



Reproduced by kind permission

Fig. 9. Spleno-venogram twelve months after subcardiac porto-azygos disconnexion. It is seen that none of the opaque fluid passes the gastric suture line into the oesophagus. (From *Chirurgische Praxis* (1959) p. 175.)

Finally a splenovenogram made eighteen months after operation shows abrupt limitation of the opaque fluid in the region below the suture line (Fig. 9).

OTHER METHODS OF PORTO-AZYGOS DISCONNEXION

There are many other methods of producing porto-azygos disconnexion.

Combined with subtotal gastrectomy

This method obviates the post-vagotomy effects on the stomach, the risks associated with acid reflux into a highly vascularized oesophagus, and the danger of having overlooked a concomitant peptic ulcer. The stomach is mobilized as for an ordinary Polya gastrectomy, the mobilization including the whole stomach, the cardia and the lower 5 cm. of oesophagus. The duodenum is transected and closed, the stomach is tran-

sected 3 cm. below the cardia and removed (Fig. 10). A gastro-jejunal anastomosis is made (Fig. 11). It is not safe to leave 5 cm. of the stomach in this operation, because the gastric remnant is not so well buried during a gastro-jejunal anastomosis as it is in a gastro-gastric anastomosis. In one case in which 5 cm. was left a small area of necrosis appeared near the suture line on the greater curve side, leading to a subphrenic abscess.

Oesophago-jejunal anastomosis

Another method, which has the advantage of avoiding dissection near the vascular region below the cardia, is to transect the oesophagus and

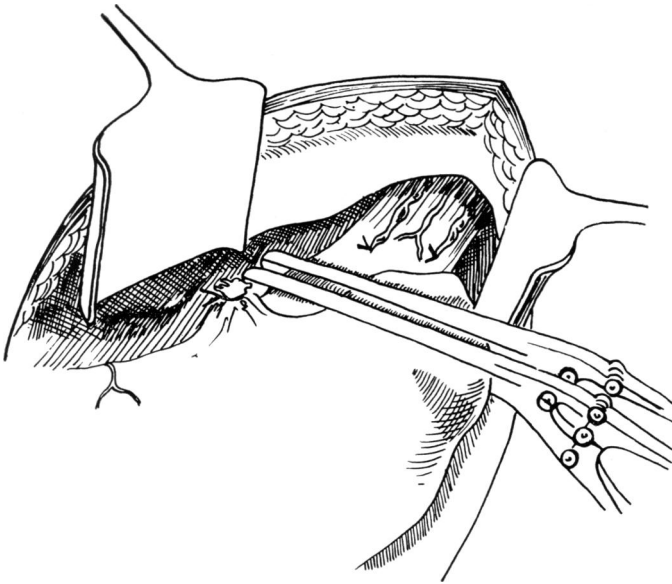


Fig. 10. The stomach, cardia and lower oesophagus are devascularized through a high abdominal approach. The stomach is clamped and transected 3 cm. below the cardia.

perform an oesophago-jejunostomy. For this an abdomino-thoracic incision is made, the lower oesophagus is mobilized and transected at the cardia. The lower end is closed and inverted into the stomach (Fig. 12). It is wise to avoid leaving any *oesophageal* mucosa inverted into the stomach, hence the transection should be *at* the cardia. A Roux-en-Y loop of jejunum is now constructed and brought through a separate opening made in the diaphragm and united to the oesophagus (Fig. 13). The Roux loop may be brought up behind or in front of the pancreas, and through the transverse mesocolon. The retention of the defunctioned stomach has so far not been known to give rise to any complications.

Oesophago-gastrectomy

Another method of disconnexion is of course to carry out an oesophagectomy, removing the lower or the whole thoracic oesophagus, and restoring continuity by either oesophago-gastric anastomosis, or by replacing the oesophagus with colon. It is perhaps stretching the point

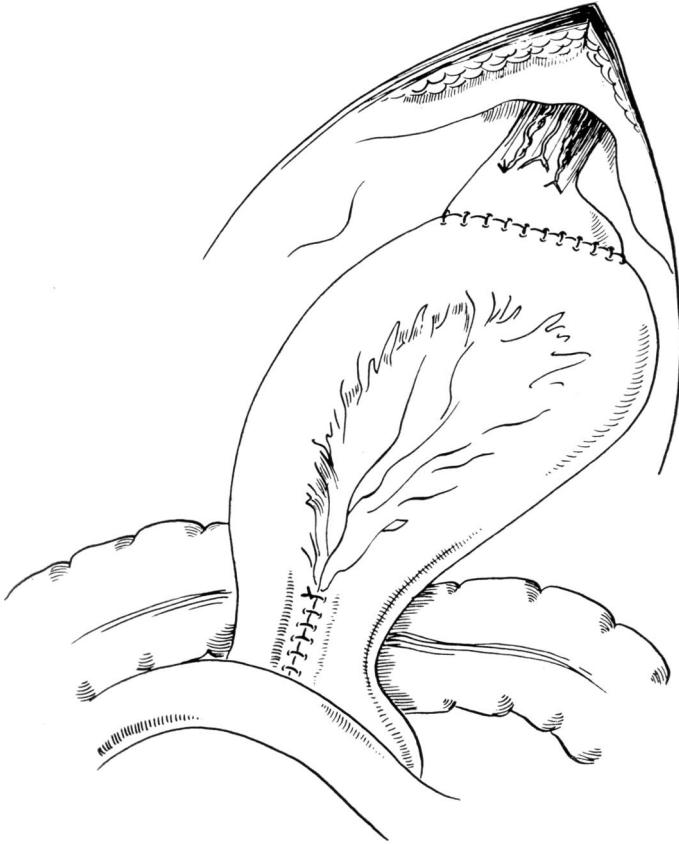


Fig. 11. Following transection and removal of the lower stomach, a gastro-jejunal anastomosis is made, followed by entero-anastomosis. A Roux-en-Y loop of jejunum may be used as an alternative.

a little to regard this as a variety of porto-azygos disconnexion. Nevertheless, a disconnexion occurs in the operation.

Next, I will mention some methods of porto-azygos disconnexion that I have so far not carried out.

Replacement of oesophagus by a plastic tube

Since Berman (Berman, 1952) suggested the replacement of segments of oesophagus by a plastic tube it has seemed to me that in theory this method should be ideal for oesophageal varices, for varicosities would be unlikely to grow in the length of granulation tissue which develops outside the tube.

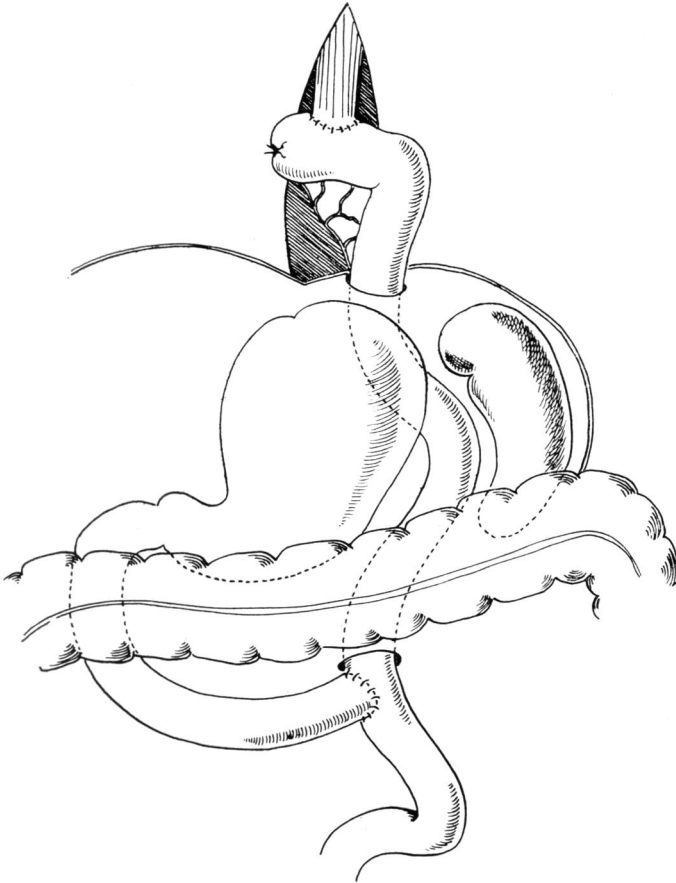


Fig. 12. The lower oesophagus is devascularized and transected at the cardia. The lower divided end of the oesophagus is closed and invaginated into the stomach. A Roux-en-Y loop is constructed.

The reason that I have not used plastic tube replacement of the lower oesophagus for oesophageal varices was that I found in carcinoma cases a notable morbidity as a result of mediastinal infection at the point where the upper end of the tube was attached to the oesophagus. I have experimented with softer tubes using stiffened extremities, but have so far not

PORTO-AZYGOS DISCONNEXION IN THE TREATMENT OF BLEEDING

felt that the method was safe enough to use in cases of oesophageal varices. Terracol and Sweet (1958) also report unhappy experiences with the plastic tube. However, I notice that Dr. M. N. Nachlas (1956) has made a plastic tube replacement in five cases of massive bleeding with three survivals of 9, 10 and 13 months respectively.

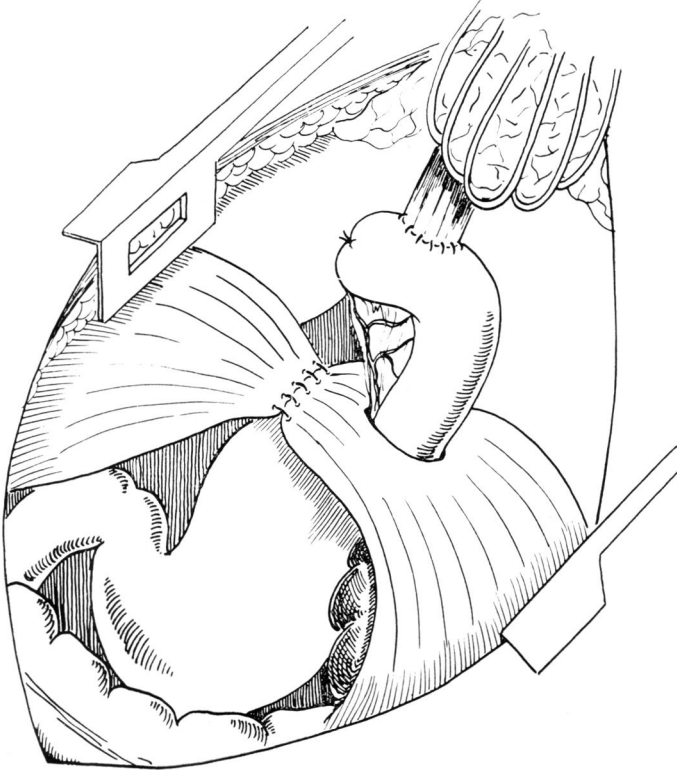


Fig. 13. The Roux-en-Y loop is brought up through a separate opening in the diaphragm and anastomosed to the cut end of the devascularized oesophagus.

Oesophageal transection

Professor Milnes-Walker of Bristol has practised transection and resuture of the oesophagus instead of the upper stomach, because of its greater ease and speed of performance. The disadvantage would be the diminished security of oesophageal anastomosis and the fact that the lowest varices remain in the hypertensive area, though the volume of blood flow through them would be reduced.

“ Dissektionsligatur ”

Professor Dr. Vosschulte (1957) of Giessen transects the veins of the lower oesophagus by a method of his own. The lower oesophagus is exposed after making a transverse abdominal incision extending into the left costal margin. An incision is made round the muscularis of the lower oesophagus down to the mucosa. A high gastrotomy is made and through this is introduced a hollow ring-shaped prosthesis with an outer groove, on a special introducing forceps. The prosthesis rather resembles one-half of a Murphy button. A tight encircling ligature round the mucosa compresses the veins against the groove in the prosthesis. The muscularis is carefully repaired. A few days later the mucosa sloughs and the prosthesis is extruded. Stenosis of the oesophagus may follow this, but in 15 survivors of the procedures up to date there has only been one who bled again.

TRANSECTION AND RE-ANASTOMOSIS OF STOMACH

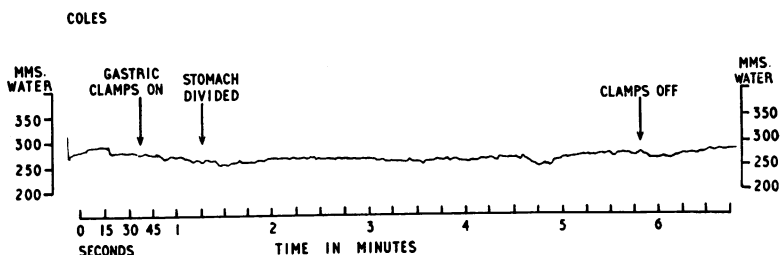


Fig. 14. Continuous portal pressure record during subcardiac porto-azygos disconnexion. This was made by my former Senior Registrar, Mr. Cyril Shaldon, while working in Professor R. Milnes-Walker's clinic at Bristol.

Accessory procedures

Portal hypertension is a complex condition, particularly when due to liver disease, and disconnecting the oesophageal varices from the portal circulation does not answer all the problems, though, if successful, it deals with the most urgent risk to life.

In theory the portal pressure should rise after disconnexion, though this has not been proved, and continuous records of the portal pressure during the operation, made in Professor Milnes-Walker's clinic, show no notable rise (Fig. 14). In some cases I have compensated for this by tying the left gastric and splenic arteries and reducing the portal inflow. In other cases we have added a spleno-renal anastomosis, though this made the operation somewhat formidable.

Splenectomy

We have usually left the spleen *in situ*, with the intention of keeping it for subsequent spleno-renal anastomosis in the event of failure of the disconnection. We only remove the spleen during disconnection if there is a marked thrombocytopenia, if the presence of the spleen causes operative difficulties or if it suffers damage during the disconnection. Whenever it is removed the advisability of coincident spleno-renal anastomosis should be carefully considered, particularly if there is any ascites, or if the portal vein itself is not patent.

In view of the tendency of these patients to develop portal thrombosis splenectomy introduces a risk of splenic vein thrombosis, which may be followed either by portal vein thrombosis or of the occurrence of portal embolism ("Zahn's infarcts") in the liver (Symmers, 1951). This complication contributes to hepatic failure.

Ascites

In the presence of associated oesophageal bleeding and severe ascites it is usually wiser to carry out side-to-side or end-to-side porto-caval anastomosis. We have tried the Crosby-Cooney button (Crosby and Cooney, 1946) without success. We have used sapheno-peritoneal anastomosis in three cases with failure in one, modified success in one, and outstanding success in one case of chylous ascites without portal hypertension.

RESULTS

Following my demonstrations of this operation over ten years ago, and talks on the operation during a tour of the United States, many surgeons gave it repeated trials, for then, as even now, we are far from having reached unanimity on the most satisfactory surgical method of dealing with these cases.

I have already mentioned that the results of the first operation which left the cardia and its collateral circulation undisturbed were highly unsatisfactory. Professor Milnes-Walker, who kindly placed his figures at my disposal, tells me that all the survivors of his 13 cases treated by gastric transection without devascularization had recurrent bleeding.

The results of the subcardiac transection which was used since 1949 were much better, no doubt because the devascularization was carried up to and above the cardia.

Before giving details of the results, I would like to make some general remarks. Any new surgical procedure may be followed by failure and disappointment. This may be because the logic of the operation is faulty, or because some complicating factor has not been dealt with. We all

NORMAN C. TANNER

remember that vagotomy was abandoned in 1912 because of the failure to deal with the complication of gastric stasis and eructation.

Therefore I have endeavoured to analyse the bad results and correct their cause as far as possible.

I will first of all give my personal results, in cases of total portal hypertension, complicated by massive bleeding and operated on between 1950 and October 1959 (minimum follow-up six months).

TOTAL CASES OF COMPLETE PORTAL HYPERTENSION OPERATED ON FOR MASSIVE BLEEDING (1950-1959)

Cirrhosis	{	Alcoholic	12
		Bilharzial	7
		Wilson disease	2
		Other	25
Extrahepatic portal vein block		12	
TOTAL			<u>58</u>

For comparison I will record the results in those patients who had shunt operations.

VENOUS SHUNTS (1949-1959)

	No.	Post-operative death	Late death	Encephalopathy	Recurrent bleeding
1. <i>Porto-caval anastomosis</i> ..	21	2 (9.5%)	6	9 (3 fatal)	2
2. <i>Spleno-renal shunt</i>					
(a) Alone	3	2	0	0	0
(b) Combined with disconnexion ..	3	0	0	1 (minor)	1 (minor)
TOTALS of all shunts	27	4	6	10 (3 fatal)	3

It will be seen that recurrent bleeding is unusual, about 10 per cent., but when it occurs it tends to cause liver coma. The worst feature is nitrogen intoxication or encephalopathy in 10 out of 23 survivors, leading to death in three. Many are remarkably well, however, and lead normal lives. Next, I will record in similar fashion the results of subcardiac porto-azygos disconnexion.

PORTO-AZYGOS DISCONNEXION WITH SUBCARDIAC TRANSECTION (1949-1959)

Cause of Hypertension	No.	Post operative death	Encephalopathy	Major bleeding	Minor bleeding	
Cirrhosis	{ Emergency	11	4	2	2	1
	{ Interval	14	0	1	2	6
Extra-hepatic	{ Emergency	2	0	1	1	0
	{ Interval	5	0	0	3	1
TOTALS		32	4	4	8	8

PORTO-AZYGOS DISCONNEXION IN THE TREATMENT OF BLEEDING

Of these patients, 11 have died at intervals between one and six years from their operation. Several of the late deaths were due directly or indirectly to the recurrent haemorrhages noted above and so I append the causes of the late deaths.

LATE DEATHS (11) AFTER SUBCARDIAC PORTO-AZYGOS DISCONNEXION

Haemorrhage (6 cases)							
Gastric Ulcer	..	..	..	..	..	..	1
Following second operation for bleeding	..	..	..	..	..	..	3
From caecal varices	..	..	..	..	..	..	1
? From oesophagus (? silk ulcer)	..	..	..	..	..	..	1
Thrombosis of portal vein	..	..	..	..	..	..	1
Encephalopathy	..	..	..	..	..	..	1
Liver failure	..	..	..	..	..	..	1
Epilepsy	..	..	..	..	..	..	1
Suicide	..	..	..	..	..	..	1
TOTAL	..	..	..	..	..	..	<u>11</u>

Note. Of the five latter deaths only one had a haemorrhage following the operation. The case of encephalopathy had had a subsequent porto-caval anastomosis for ascites.

It is possible that some of the earlier haemorrhages occurred as a result of using non-absorbable suture material, or from ulceration due to gastric stasis. This problem is now dealt with by the abandonment of non-absorbable suture material, and drainage of the stomach by gastro-jejunosotomy or pyloroplasty.

Perhaps it will help to simplify these figures if I give the present state of health of the 17 survivors of subcardiac disconnexion.

SURVIVORS OF SUBCARDIAC DISCONNEXION

	<i>Well</i>	<i>Well but has had minor episode of bleeding</i>	<i>Recurrent severe bleeding</i>
Disconnexion alone	6	4	1
Disconnexion + spleno-renal anastomosis ..	2	1	0
Disconnexion followed by porta-caval anastomosis (2 cases) or oesophago-gastrectomy (1 case)	2	1	0
TOTALS	<u>10</u>	<u>6</u>	<u>1</u>

Note. The two porta-caval anastomoses were for ascites.

Some of these minor haemorrhages are associated with heartburn or over-use of alcohol. Such minor blood losses do not require the use of the Sengstaken balloon, but two to three days' bed rest with alkalies and a milk diet.

I will next recount the experiences of other surgeons who have detailed their figures. W. P. Mikkelson and A. C. Pattison (1959) have carried

out five of the subcardiac disconnexions with recurrent bleeding in four cases, and so declare it useless in their hands.

Professor R. Milnes-Walker carried out the subcardiac transection with devascularization in five cases, with one death; the four survivors had not bled again. He has modified the operation by making an oesophageal transection in 10 cases, with two deaths due to very poor liver function and, of these, five have bled again. He is at present using a simple oesophageal mucosal transection with promising results (Milnes-Walker, R., personal communication).

Mr. Alan Hunt has used this form of disconnexion on 13 cases with recurrent bleeding in eight, one post-operative death and four are satisfactory (Hunt, Alan, personal communication).

OTHER FORMS OF DISCONNEXION USED

A short note on our experiences with other forms of disconnexion may be of interest.

Oesophageal mucosal encircling ligation

Only one such procedure was used, in 1948, and bleeding recurred later. It is my opinion that to prevent late bleeding every vein connecting the portal and azygos systems, even the invisible ones in the oesophageal muscularis, must be transected, for they are capable of great dilatation and can once more transmit hypertension and a large volume of blood into the mucosal veins above the mucosal transection.

Low oesophageal transection and oesophago-jejunostomy

This has only been carried out five times, three being within the last six months. Of the earlier cases, one operated on three years ago is well except for occasional haemoptysis, possibly the result of the pulmonary arterio-venous shunts which at times occur in portal hypertension (Georg *et al.*, 1960). The second case merits a short record because it demonstrates the difficulties of these cases.

R. L., aged 28, admitted in March 1953, gave a history of a prolonged illness due to appendicitis in 1940. We assumed later that this led to portal vein thrombosis. In 1944 he had his first haematemesis and in 1947 a splenectomy was carried out. At operation on 24th March 1953 the portal vein was found to be thrombosed and so a subcardiac porto-azygos disconnexion was carried out. Melaena occurred nine months later and the oesophageal varices were injected with sclerosing solution. In September 1954, on account of a recurrent bleeding, the oesophagus was transected and a Roux-en-Y loop of jejunum brought up and united to the end of the oesophagus.

He remained fairly well for six years with an excellent nutrition and appetite, though with occasional melaena and slight haematemesis. Severe bleeding recurred in December 1959 and so he was operated on again. The oesophagus was exposed from the right thorax, a 10 cm. incision made into it and the varices, which appeared intact, were ligatured over a distance of 12-14 cm. A few days later bleeding recurred, mainly melaena. A laparotomy disclosed that the blind sac of stomach was collapsed

PORTO-AZYGOS DISCONNEXION IN THE TREATMENT OF BLEEDING

and empty of blood, but the bowel was full. A very large tributary of the superior mesenteric vein was found and a wide anastomosis made between it and the end of the left renal vein after nephrectomy. A few days later catastrophic bleeding recurred. By this time he had had transfused 76 pints of blood. The whole oesophagus was then excised with the idea of a later reconstruction with colon. He stood this well, but a few days later had a further massive haemorrhage and died.

At autopsy the jejunal-renal venous anastomosis was wide and patent, demonstrating the comparative uselessness of such shunts. The site of bleeding was the caecum. Adhesions following the appendicitis of 1940 had led to the development of varicosities between the caecum and the parietes, and a few superficial caecal erosions in this highly vascular area had led to his exsanguination.

Oesophago-gastrectomy

Only one oesophago-gastrectomy with oesophago-gastric anastomosis was carried out in this series, the case already described.

Mr. Alan Hunt tells me that he has carried out 23 such resections with nine complete and seven partial successes. He finds the morbidity of this operation considerable as a result of weight loss, stricture formation, fistula, subphrenic abscess and bilious regurgitation.

Oesophago-gastric devascularization, subcardiac transection and gastro-jejunal reconstitution (with subtotal gastrectomy)

This is the operation we are now using, for the reasons previously mentioned, and have carried out so far on five cases. It is too early to assess it. It is most important to add that a very high gastrectomy alone, which leaves 50 per cent. of the porto-azygos collateral circulation intact, is not an adequate procedure.

CONCLUSION

The first conclusion I must make is that all these operations can at times be very difficult and hazardous.

There would seem to be a place for some form of porto-azygos disconnection as an emergency operation in cases of acute bleeding, and as an interval operation in cases of recurrent bleeding from oesophageal varices where a porta-caval or spleno-renal shunt is impracticable, or where some degree of nitrogen intoxication (encephalopathy) exists.

Such operations should be carried out at an early stage, as soon as it is evident that bleeding is recommencing after 24 hours' balloon tamponade.

Vagotomy symptoms of gastric obstruction may follow porto-azygos disconnection.

Non-absorbable sutures must not be used on or near the suture line.

Minor haemorrhages, not requiring the use of balloon tamponade, may be expected to occur in over 33 per cent. of subcardiac porto-azygos disconnexions. An attempt is being made to reduce their number by making the anastomosis between the devascularized cardiac end of the stomach and the jejunum.

Subcardiac porto-azygos disconnexion gives greater protection against recurrent massive bleeding than simple ligation of the varices.

A high protein diet may be given after porto-azygos disconnexion with little risk of encephalopathy.

In carrying out such procedures as these we have all been encouraged by John Hunter's advice to "try the experiment". It is no less important to follow his methods of careful inductive reasoning based on a patient study of the outcome of the experiments.

BIBLIOGRAPHY

- BERMAN, E. F. (1952) *J. Internat. Coll. Surg.* **18**, 695.
BOEREMA, I. (1949) *Arch. Chir. Neerl.* **1**, 4174.
CRILE, G., jr. (1953) *Surg. Gynec. Obstet.* **96**, 573.
CROSBY, R. C., and COONEY, E. A. (1946) *New Engl. J. Med.* **235**, 581.
GEORG, J., and others (1960) *Lancet*, **1**, 852.
LINTON, R. R. (1953) *Gastroenterology*, **24**, 1.
MIKKELSON, W. P., and PATTISON, A. C. (1959) *Surgery*, **46**, 501.
NACHLAS, M. M. N. (1956) *Arch. Surg. (Chicago)* **72**, 634.
PHEMISTER, D. P., and HUMPHRIES, E. M. (1947) *Ann. Surg.* **126**, 397.
SYMMERS, W. St.C. (1951) *Brit. J. Surg.* **38**, 498.
TANNER, N. C. (1950) *Proc. Roy. Soc. Med.* **43**, 147.
——— (1951) *Edin. med. J.* **58**, 288.
——— (1954) *Proc. Roy. Soc. Med.* **47**, 25.
TERRACOL, J., and SWEET, R. H. (1958) *Surgery of the Esophagus*. W. B. Saunders, Philadelphia & London, p. 417.
VOSSSCHULTE, K. (1957) *Der Chirurg*, **4**, 186.

GRANT OF DIPLOMAS TO FELLOWS IN DENTAL SURGERY

AT THE FINAL EXAMINATION for the Fellowship in Dental Surgery held in January, 11 candidates out of 34 were successful.

At the meeting of Council on 9th February, Diplomas of Fellowship in Dental Surgery were granted to the following:

- LOWENBERG, Beate Franziska (*The London*).
CHAPMAN, Anthony John (*Guy's*).
SHORT, Aubrey Gordon (*New Zealand*).
KIRKWOOD, John (*Sydney*).
VAN WYK, Christian Werner (*Pretoria*).
NEWELL, Michael John (*Leeds*).
EMERSON, Thomas George (*Belfast*).
HOPKINS, Russell (*Durham*).
WREAKES, Glyn (*Leeds*).