THE RADICAL CURE OF INGUINAL AND FEMORAL HERNIA WITH A POLYTHENE INSERT

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This paper records the experience gained in the use of "polythene" in the radical cure of inguinal herniae since August, 1946, and its application in the cure of certain femoral herniae. I carried out 103 herniorrhaphies in one surgical unit at the Manchester Royal Infirmary from August, 1946, to February, 1950. Out of this number 61 were polythene repairs, and, with the exception of one case which was lost through change of address, all were seen regularly at the follow-up clinic. The results are set out in the accompanying Table.

The series as a whole is a selected one and contains only those herniae which, after general assessment, were found to require a major repair and might therefore be suitable for a polythene insert. At operation 24 out of 75 inguinal herniae were found to require only excision of the sac, narrowing of the internal ring, and simple darn of the transversalis fascia with nylon.

No arguments are put forward here for introducing polythene in the repair of these difficult herniae, but it has been the aim to reduce the recurrence, rejection, and morbidity rates to *nil*. This aim has so far been

achieved, with the exception of one case in which a persistent sinus led to the removal of the plate. Some of the older patients were persuaded to have a polythene plate repair after wearing a truss for many years, and all active workers have returned to their occupations within six weeks of operation.

Polythene

This long-chained polymer of ethylene was first introduced in this country by the I.C.I. in 1933. As it is made by a melting-out process which does not involve the use of plasticizers, it produces a minimal fibrous tissue reaction when introduced into the body.

To the naked eye polythene has a waxy, white appearance and feels slightly soapy to the touch. It repels water, on which it floats, and is light and cheap. In sheets 1/16 in. (0.16 cm.) thick it is quite firm, but can be bent without breaking. It is easily cut by scissors and can be perforated by a Mayo needle. The degree of polymerization of the ethylene molecules changes the physical characteristics. Grade 200, with a molecular weight of 12,000 and a melting-point of 115° C., was chosen for implantation in the tissue, as in 1/16-in. sheet form and at body temperature it is capable of withstanding normal muscular strains. Polythene is non-opaque to x rays and cannot be sterilized by autoclaving. It is best sterilized by soaking it in perchloride of mercury 1 in 1,000, biniodide of mercury 1 in 1,000, lysol, or "dettol."

The plastic is lighter than water, so it must be weighted to the bottom of the solution in which it is

	Polythene and Combined		Other Methods	
	Inguinal Hernia	Femoral Hernia	Inguinal Hernia	Femoral Hernia
No. of cases	45	10	22	17
Bilateral herniae	6	—	2	1
Total herniae	51	10	24	18
Repairs	44 polythene 7 combined	10 combined	Nylon repair T. fascia and int. ring	Lockwood using nylon
Male	42	4	16	7
Female	3	6	6	10
Right	22	7	9	12
Left	29	3	15	6
Ages in years	31-85	38-74	22-77	36-77
Average	52	52	43	53
Strangulated	4	6	1	10
Resections	None	1	None	3 (through separate abdominal incision)
Types:				
Oblique	26	1 with O.I.H.	17	—
Direct	9	1 with D.I.H.	2 bilateral	—
Saddle-bag	1	—	1	—
En glissade	3	—	—	—
Recurrent hernia	6 3 oblique 1 en glissade (following herniorrhaphy and orchidectomy)	2 —	1 (recurrent oblique)	None — —
Anaesthesia:				
Spinal	35	7	18	11
General	5	3	2	1
Local	5	—	2	5
Complications	1 sinus (persistent) 1 mild infection 1 haematoma	None	1 sinus (temporary) 1 hydrocele	1 long saphenous varix
Recurrences	None	—	None	1 D.I.H. same side 3 O.I.H. " "
Appearances of hernia on opposite side	6	—	1	1
Deaths	None	1 strangulated non-resection case	None	1 strangulated (non-resection case)
Follow-up	All cases	All cases	All cases	1 case lost through changed address

Diagram showing average size of polythene insert. 1/16-in. thick plate, polythene I.C.I., Grade 200. A, Stitch hole for suture to Cooper's ligament. B, Stitch hole for suture to deep femoral arch. C, Stitch hole for suture to Poupart's ligament.

being sterilized by wrapping it in lint. The size of plate used to replace the transversalis fascia in the cure of inguinal and femoral hernia is shown in the diagram.

• The Combined Repair

The incision is made in Langer's tension lines beginning over the outer third of Poupart's ligament and extending inwards as far as the external ring, where the incision curves downwards for 1 in. (2.5 cm.). The skin flap is reflected downwards, exposing the inguinal and femoral rings. If a femoral sac is present it is dissected out and reduced by incising Hey's ligament and the constriction ring in the neck of the sac where necessary. The external oblique is next divided in the direction of its fibres and the upper and lower flaps are turned back. The cremaster muscle along with the ilio-inguinal nerve is now removed from in front and behind the cord, exposing the structures of the cord, the free lower arching border of the internal oblique muscle, the conjoint tendon, transversalis fascia, Poupart's ligament, the internal ring, and any sacs which may be present. This necessitates ligation and division of the cremasteric vessels as they pierce the transversalis fascia opposite the deep epigastric vessels.

The oblique sac is next dissected out and the peritoneum liberated in all directions for 1 1/2 in. (3.8 cm.) from the fascial attachments at the internal ring. As the sac is usually a wide-necked structure, it is cut off and the opening is closed by a running catgut stitch. The finger is then passed medially behind the deep epigastric vessels and transversalis fascia in the extraperitoneal fat, and the transversalis fascia incised as far as the attachment of the conjoint tendon to the pectineal line. The deep epigastric vessels are divided and ligated during this manoeuvre. The upper flap of the transversalis fascia is reflected upwards and the peritoneum and extraperitoneal fat are stripped off the lower flap, thus exposing the femoral canal. If the latter structure contains a sac or admits the tip of the index finger, the lower flap of the transversalis fascia is turned back and sutured to Cooper's ligament by a fine nylon running stitch. An abnormal obturator artery may need dividing.

Recent experience in closing the femoral ring by this method has shown that occasionally the transversalis fascia is not strong enough; in these cases it is necessary, after turning back the lower flap of the transversalis fascia, to strengthen it by a nylon darn.

This procedure prevents Poupart's ligament from being pulled out of line and gives adequate closure of the femoral canal without compressing the femoral vein.

The polythene plate is next placed in the extraperitoneal fat. The lower border of the plate is fixed by stitching it medially to Cooper's ligament just behind the insertion of the conjoint tendon into the pectineal line, and laterally to Poupart's ligament opposite the deep epigastric vessels. The upper flap of the transversalis fascia is now brought down and sutured to Cooper's ligament, Gimbernat's ligament, the deep femoral arch, and Poupart's ligament by a running catgut No. 0 suture, stitching medio-laterally in the above order. The cord is replaced and the external oblique and skin are sutured in the usual manner.

It is stressed that this repair does not destroy any muscle tissue other than the cremaster which is excised, and no stitches are inserted into the free arching border of the internal oblique. Thus the sphincteric mechanism of Sir Arthur Keith is left intact. The new internal ring is displaced outwards for 1 in. (2.5 cm.) under the strong arching fibres of the transversalis and internal oblique muscles, thus increasing the obliquity of the inguinal canal. The weak area of the transversalis fascia below the conjoint tendon, which has been partly used to close the femoral canal, is replaced by the strong polythene plate.

Anaesthesia and Post-operative Treatment

As this operation involves an extensive dissection with relaxed muscles and fascial planes, spinal anaesthesia is still the method of choice. General anaesthesia with curare finds a place in certain strangulated cases, as does local analgesia in the older age groups.

Patients are instructed in breathing exercises in the immediate post-operative period; smoking is forbidden. From the first post-operative day they take part in the routine ward exercises, which are gradually increased in range until the ninth post-operative day, when the patients get up. Older patients get up as soon as they feel able, and this is usually about the third day. Patients are allowed to go home by ambulance on the tenth post-operative day and are instructed to continue exercises and gradually to increase the period of remaining up until they are up and about fully dressed three weeks after operation. After six weeks' convalescence patients return to light duties. Three months after the operation they begin full duties.

Indications and Results

Sixty-one polythene repairs have been performed since August, 1946, and every case has been carefully followed up. No patient has complained of any pain in the wound, and no plate has moved, fragmented, or caused secondary suppuration. Most patients notice a little numbness at the inner angle of the wound, but none have complained about this. No testicular atrophy, hydrocele, or varicocele has been seen. Thus the follow-up, up to three and a half years, has been very gratifying.

No recurrences have been seen, but eight herniae have appeared on the opposite side, and three oblique inguinal herniae on the same side have been noted within two years of performing Lockwood's repair for femoral hernia. As these herniae are directly due to altering the mechanism of the inguinal canal, they ought to be classified as recurrent herniae, thus giving a recurrence rate of 17%. This rate is sufficient to condemn the low operation of Lockwood in those patients who might be expected to have a preformed oblique sac. The

combined operation is therefore reserved for large and long-standing femoral hernia, recurrent hernia, pre- and post-vascular hernia, and femoral hernia in young adult males who have heavy occupations or chronic chest trouble.

Three wound infections occurred in this series, one of which led to a persistent sinus. The polythene plate was removed after being in place six months. This was remarkably easy to perform, as the plate had simply become encapsulated in a smooth fibrous tissue envelope the thickness of brown paper. No further repair was necessary, and follow-up of this patient three years later showed no recurrence.

Summary

A personal consecutive series of 103 inguinal and femoral herniae is reviewed in which 61 polythene repairs were performed. The detailed results are given with the follow-up up to three and a half years. No recurrences, in the generally accepted sense, have occurred to date. The operation of Lockwood gives rise to a "recurrent" oblique inguinal hernia in about 17% of cases and ought not to be used as a routine. The combined repair is described in detail.

I would like to thank Mr. A. Graham Bryce for allowing me to carry out this work in his unit at the Manchester Royal Infirmary, also to Messrs. I.C.I., Ltd., for further chemical details and for supplying the polythene sheets.

Medical Memoranda

Essential Thrombocytopenia, Gastro-intestinal Haemorrhages, and Peptic Ulceration as a Diagnostic Problem

Essential thrombocytopenia may become manifest by repeated haemorrhages from the gastro-intestinal tract, but the following case shows that this should not obscure the possibility that a coincidental condition is causing the bleeding.

Case Report

The patient, a man aged 50, was well until the age of 12, when he began to have severe nose-bleeding, which persisted until he was 18. At this age he developed an effusion into the left ankle-joint following a slight injury: this effusion was proved to be haemorrhagic when it later ulcerated through the skin, and in 1922 required surgical removal. At this time he was thought to be suffering from haemophilia, but his family history had no record of any relations with a similar disease. He remained well for two years, but in 1924 had his first haematemesis, and this was repeated in 1925 and 1926. These haemorrhages were not preceded by any abdominal pain. After the last haematemesis he entered the Liverpool Royal Infirmary. His blood count then was red cells, 4,700,000; haemoglobin, 75%; platelets, 127,000. A diagnosis of essential thrombocytopenia was made, for which the patient was treated by splenectomy.

He remained well until 1934, when he developed indigestion, which occurred about four times a year in attacks lasting three to four weeks at a time. An upper abdominal ache came on two hours after food but never awoke him at night, and it was relieved in twenty minutes by taking food or alkali. This indigestion was associated with all his subsequent intestinal haemorrhages. So far as he can remember, these occurred in the following manner: 1938, haematemesis (a barium meal two months later was said to have shown no abnormality); 1941, melaena; 1943, melaena (barium meal again said to be normal); 1944, melaena; 1945,

melaena; April, 1948, haematemesis; December, 1948, haematemesis; 1949, melaena and haematemesis.

In 1946 he attended a hospital because of a tumour of the left side of the skull, in the parietal area, which had been developing over the previous eight years. Blood investigations at that time gave the following results: red cells, 4,600,000; haemoglobin, 92%; white cells, 12,200; platelets, 32,000; bleeding time, 9½ minutes; coagulation time normal. This tumour was removed in 1948, and was found to be a large haematoma which had eroded the bone. Later in the year the area had to be skin-grafted after the removal of a further clot.

His most recent illness started early in September, 1949, with a further attack of indigestion, which continued until on the 20th he passed a melaena stool. His indigestion then became more severe and he started to vomit. A small haematemesis occurred on September 27, and was repeated several times on October 2, when he vomited about two pints (1.14 litres) of blood. He was admitted to the West Middlesex Hospital that night.

Examination showed him to be very exsanguinated and the blood pressure at first was unobtainable, but when he had rallied it was found to be 154/88. Later examination showed no abnormality in any system. No telangiectases were seen on the skin, but there were several scars—one from the splenectomy in the left subcostal region, one in a depressed area in the left parietal region, and a third on the left ankle, which showed slight limitation of movement.

He was transfused immediately on admission, four pints (2.27 litres) of blood being given between 8.45 p.m. and 5 a.m. the next day, when he was greatly improved. Over the next few weeks the following investigations were made:

Blood Counts.—October 5 (immediately after transfusion): Red cells, 2,900,000; haemoglobin, 7.6 g. (52%); M.C.H., 26 µg.; 12% late normoblasts; white cells, 11,600 (polymorphs 68%, lymphocytes 28%, monocytes 1%, eosinophils 3%). Platelets were too scanty for accurate estimation. November 18: Red cells, 4,500,000; haemoglobin, 11.8 g. (80%); M.C.H., 26 µg.; bleeding time, 1 minute; coagulation time, 1½ minutes.

Radiographs.—October 28: A barium meal showed a small gastric ulcer on the lesser curvature of the stomach; a barium swallow had revealed no abnormality.

Gastrosocopy.—On November 10 gastrosocopy showed a small gastric ulcer at the angularis, with shelving sides and rugae radiating from it.

Consideration of the case suggested that all the intestinal bleeding since 1938, when his indigestion started, was probably from peptic ulceration, and that surgical treatment was clearly indicated.

On November 22 he was operated on under regional analgesia after a transfusion of one pint (568 ml.) fresh blood. The anterior wall of the duodenum was scarred from previous ulceration, and an active gastric ulcer ¼ in. (1.25 cm.) in diameter was found on the posterior wall of the stomach near the lesser curvature. No splenunculi were seen. A partial gastrectomy of the Polya-Hofmeister type was performed. Bleeding was not excessive during the operation, although the clots did not retract well, and the post-operative course was uneventful except that there was a slight vomit of blood-stained material on the second day.

A blood examination made on December 6 showed: Red cells, 4,750,000; haemoglobin, 11.9 g. (80%); M.C.H., 25 µg.; white cells, 12,800 (polymorphs 47.5%, lymphocytes 48%, monocytes 2.5%, eosinophils 2%); platelets, 199,000; bleeding time, 1 minute; coagulation time, 1 minute 15 seconds.

Since the operation the patient has had no symptoms and no haemorrhage, but it is still too soon for a final assessment of the result.

Comment

The interest in this case lies in the delay in the diagnosis, which resulted in many serious haemorrhages, the last of which was nearly fatal. This delay was