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Studies on Indirect Lymphography of the Rectum in Man

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No method of assessing the extent of lymphatic spread of carcinoma of the colon-pre-operatively is available, and no satisfactory method of outlining the colonic lymphatics by lymphangiography has been developed. Direct lymphangiography as developed by *Kinmoth* (1955) is largely limited to the study of the lymphatic drainage of the limbs and those lymph vessels and nodes which the limb lymphatics drain into. This technique is therefore inapplicable for demonstrating the inferior mesenteric lymph chain. This paper describes an attempt to demonstrate radiographically the inferior mesenteric lymph chain in man by using indirect lymphangiography.

A previous attempt has been made to demonstrate this lymph chain radiographically in dogs (2). However, there was poor and inconstant uptake of the contrast. Nevertheless, we felt that an attempt to develop this method in man could be made since lymphatic system in different species vary in their response to any injected contrast medium (3).

Patients and Methods

Permission for this study was given by the Hospital Ethical Committee. It was stipulated that the study could be performed only on patients with rectal cancer who were to undergo abdomino-perineal resection of the rectum within a few days of the injection of the contrast medium.

Eleven patients were approached: one refused permission and three cases had to be abandoned as the introduction of the proctoscope was painful.

Seven patients were therefore studied, and their informed consent to the study was obtained.

All tumours were sited within 10 cm of the anal verge. All patients received a rectal washout immediately prior to the investigation. With the patient lying in the left lateral position and using a Clifton proctoscope 3.0 to 7.5 ml of Lipiodol Ultra-fluid were injected into the low rectal submucosa in the same manner as the injection of haemorrhoids. Intermittent fluoroscopy was used and films exposed at various times up to the time of the operation, usually 24–48 hours later. All films were taken on a Philips Rotalix R030 50 overcouch tube. Du Pont Cronex 4 film with Hi plus fast tungstate intensifying screens were used throughout the study.

In five patients an abdomino-perineal resection of the rectum was performed, and in two patients a Hartmann's operation was performed. After surgery, the excised rectum was placed in saline and immediately X-rayed. Black threads were sutured through the tissues containing the contrast to enable the pathologist to prepare slides of that tissue. After fixation numerous step blocks of tissue were taken from the specimen, beginning at the ano-rectal junction and proceeding in a cephalic direction to a point immediately proximal to the carcinoma. Paraffin sections from each of the blocks were then stained with Haematoxylin and Eosin.

As soon as the patients condition allowed, post-operative pelvic films were taken to determine whether any contrast medium lay within the pelvis.

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Table 1 Main radiological and histological findings in the two patients with histological evidence of uptake of contrast medium

Patient	*Injection to operation time*	*Main radiological findings*	*Main histological findings*
R.L.	5 days	Considerable tracking along levator ani and pre-sacrally. 2 possible LNs on L side of sacrum 3 cms above injection site.	Oleogranuloma formation in rectal submucosa and peri-rectal fat. Early oleogranuloma formation in 3 LNs at 3 cms from the injection site.
R.F.	1 day	Minimal tracking of contrast	Early oleogranuloma formation in 1 LN at 4 cms from the injection site.

LN = Lymph node

Results

No patient complained of pain from the injection, and no clinical side-effects were noted.

In only one patient (R.L.) were there any radiological features of possible lymph node uptake of the contrast medium (Table 1). On this patient's post-operative pelvic film taken at 12 days there were two small, poorly defined discrete areas of contrast lying to the left of the midline within the pelvis 3 cm above the injection site which were not evident on any pre-operative films. No lymphatic vessels were seen. Unfortunately, this patient eventually succumbed, and no further films could be taken to localize the contrast. It was impossible to ascertain whether this contrast lay within the lymph nodes or the para-rectal tissues.

All cases showed some spread of the contrast both submucosally and through the para-rectal tissues (Figs. 1 and 2). The spread appeared to be independent of the volume of contrast injected and the time interval between injection and operation. In three patients contrast was seen to lie along the course of the levatores ani muscle and pre-sacrally. This contrast medium had no radiological features suggestive of lymphatic uptake (Figs. 3A and 3B).

Histological examination showed that the injection of the contrast medium into the rectal submucosa did not cause any necrosis of the tissues. In six of the cases no local cellular response to the material was found. In only one case (R.L., Table 1) was there evidence of early local oleogranuloma formation seen at the site of the injection, this being in the rectal submucosa. Histological evidence of uptake of the contrast by the lymphatics was seen in only two patients. In one of these patients (R.L.) 3 sectioned lymph nodes showed considerable oleogranuloma formation, and all lay within 3 cms of the site of injection. More distal lymph nodes that were sectioned did not show any evidence of uptake of the contrast. In the other case (B.F.) one lymph node at 5 cms from the site of the injection showed early oleogranuloma formation.

Discussion

Our study has been a difficult one to carry out. The patients tended to be elderly, and the time available to study them pre-operatively was limited. The timing of the pre- and post-operative serial X-rays proved to be difficult, and they were taken at varied times. The localization of the extra-rectal tracking of the contrast medium was therefore difficult and unsatisfactory.

Despite these difficulties, the films show that there was no significant uptake of Lipiodol Ultra-fluid by the rectal lymphatic system in these patients. This is in agreement with the findings of Gibert. However, all of these patients has a tumor within 1–2 cms of the injection site, and it is possible that the lymphatic drainage of the low rectal submucosa was compromised by the adjacent tumor (3).

Fig. 1 Excised rectum with submucosal spread of the contrast medium

X-rays of the excised rectums showed the injected Lipiodol to be present in the tissues.

However, in all the specimens examined histologically, there was a total absence of the contrast medium in the rectal submucosa. This was to be expected since the alcohol used in the preparation of the slides would dissolve out the oil. However, we had anticipated that the cyst-like spaces produced by the injected material would have remained, and that there would have been some inflammatory reaction to the medium. No cyst-like spaces were seen except for early oleogranuloma formation in on case (R.L.) and no inflammatory reaction was present in the submucosa. In 2 patients (R.L. and B.F.) there was histological evidence of uptake of the Lipiodol by the lymph nodes, but in no case was uptake seen in any lymph node lying further than 5 cms from the site of the injection.

This relative lack of histological evidence of the presence of the contrast medium is probably due to the fact that insufficient time had elapsed from the time of the injection to the time of the operation. It takes approximately three days for the early features of oleogranuloma formation to become apparent (4), and in 4 of the patients, insufficient time had passed for this to occur. In 2 of the 3 cases in which sufficient time had elapsed for the early features of oleogranuloma formation to

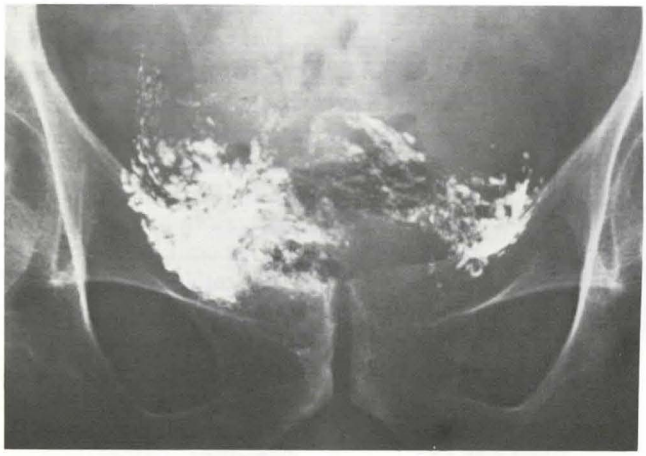

Fig. 2 Radiograph taken 4 hours after injection. Submucosal and para-rectal spread of contrast medium. No lymphatic uptake

Fig. 3A Contrast medium lying pre-sacrally and along the upper border of levator ani. Post-operative film

become apparent a Hartmann's procedure had been performed, and therefore no histology of the injection site could be obtained. In the one case in which sufficient time had elapsed, and in which the rectum could be properly examined histologically there was early oleogranuloma formation, both in the submucosa and in some of the adjacent lymph nodes. Thus, in the one case in which histological evidence of uptake of the contrast medium by the lymphatics could be expected, it was found. This suggests that if we had had enough time to allow oleogranuloma formation we would have found histological evidence of uptake in more cases.

Fig. 3B Contrast medium lying in front of the sacrum. Post-operative film

Contrast medium was seen lying along the course of the levatores ani muscle in three cases. We believe this to be due to extravasation of contrast along the upper border of that muscle.

This technique of injecting Lipiodol into the low rectal submucosa has been shown to be a safe procedure. There were no clinical side-effects and no necrosis of the tissues were seen histologically.

The study has shown that although there is histological evidence of some uptake of the Lipiodol Ultra-fluid by the lymphatics draining the rectal submucosa in patients with low rectal carcinoma the amount so taken up is so small that no discernible lymph node architecture can be determined, and in such patients it is of no use radiologically.

The next stage of the study is to use indirect lymphangiography of the rectum in patients with a high rectal carcinoma.

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