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## THE OPERABILITY OF CARCINOMA OF THE RECTUM

BY

J. C. GOLIGHER, M.B., Ch.B., F.R.C.S.

Formerly Resident Surgical Officer, St. Mark's Hospital, London

The Registrar-General's statistical review for England and Wales for the year 1936 reports 5,386 deaths from cancer of the rectum. This clearly indicates the magnitude of the problem presented by malignant disease in this situation—a problem, moreover, whose solution, in the present state of our knowledge, lies entirely with surgery. No assistance can as yet be sought from radiotherapy. It is particularly fortunate, therefore, that there are now available for this condition methods of surgical treatment, based on sound pathological knowledge, that are capable of yielding really excellent results. The writings of Miles (1939), Lockhart-Mummery (1934), and Gabriel (1937) leave no doubt on this point. If, however, the cure of rectal cancer on a large scale by surgery is to become a practical proposition it is essential that these methods should be widely applied; in other words, surgeons in general must endeavour to find operable a large percentage of the total number of cases of rectal carcinoma that they see. It seems to me that it is their failure to attain this objective that constitutes the most unsatisfactory feature of present-day treatment of this disease. Several surgeons have undoubtedly recorded high rates of operability in recent years; these for the most part, however, have represented the achievements of experts. It is strongly to be suspected that the unrecorded rate among surgeons who have no very special experience in this branch of surgery is still extremely low.

In considering the operability of rectal carcinoma it is essential to have a clear conception of the aims of radical surgery in this condition. The primary objective is naturally to secure a complete eradication of the disease, as measured by freedom from recurrence over a period of five years; but even where this is not achieved the operation is not to be looked upon as having been completely valueless. On the contrary, excision has a high palliative value, which must not be disregarded in assessing the benefits of radical surgery. Practically all cases improve enormously in general health after an excision, and, even though recurrence should eventually take place, the patient may meanwhile have enjoyed two, three, or more years of comfortable and useful life. This contrasts very favourably with the fate of inoperable cases treated solely by colostomy. For though colostomy relieves the obstructive element it does little to alleviate the other distressing features of an inoperable growth—the severe sacral or sciatic pain, the profuse rectal discharge, the occasional severe haemorrhages, and the formation of fistulae externally or into other organs—which, singly or combined, may render death from this cause one of the most unpleasant imaginable. So that even for advanced growths, in which the chances of a radical cure are relatively slight, excision, where possible, is always justifiable, provided that the mortality can be kept within reasonable bounds. In the hands of surgeons who possess the skill to do this the standard of

operability can thus safely be raised so as to include a large proportion of these late cases.

It may be said at once that this is the attitude taken by the surgeons at St. Mark's Hospital, where approximately 120 new cases of carcinoma of the rectum are seen annually and where a high operability rate is observed. The present paper is a study of the operability of rectal cancer at that institution. It is based essentially on the recorded findings on all new cases of the condition dealt with over a period of ten years, from 1930 to 1939 inclusive—1,186 in all. Some additional material from the pathological department has also been included.

### Definition of Operability

Cases classed as operable were those in which the surgeon considered the conditions favourable for a radical extirpation of the disease by operation. Not all of these patients did actually have a radical removal carried out. Some who were provisionally considered operable refused to have an excision performed because of their abhorrence of a colostomy; and others who were in the process of having such a removal and who were definitely known to be operable unfortunately succumbed after a preliminary colostomy operation or declined to proceed to the final stage. The prospect of ultimate cure was naturally less in some cases than in others, but no case was considered operable unless there appeared at the time of the operation to be some chance of complete cure. Patients on whom excision was performed but whose growths were known not to have been removed completely (as, for example, when a small secondary nodule was present in the liver) were not included. They were grouped as palliative excisions under the heading of "Inoperable" cases.

Table I shows the distribution of cases in operable and inoperable groups, and indicates the forms of treatment adopted.

TABLE I.—*Analysis of Rectal Carcinoma Material at St. Mark's Hospital (1930-9 inclusive) (1,186 Cases)*

Operable		Inoperable	
Expectant (refused operation)	23	Expectant	42
Radium	5	Curettage and diathermy	4
Local excision	38	Radium	17
Colostomy or caecostomy alone*	23	Laparotomy alone	10
Hartmann's operation	14	Colostomy	387
Perineal excision	291	Palliative excision	11
Combined excision	321		
Total	715 (60.3%)	Total	471

\* Died before the second stage of a radical excision or refused further treatment.

Inoperability was determined either by an unsatisfactory general condition of the patient which rendered him unfit for a radical operation, or by an advanced state of the growth which placed it beyond the reach of surgery.

### Inoperability due to Patient's General Condition

A subnormal general condition of the patient was seldom accepted as a reason for refusing operation altogether, though it may have modified the form of treatment given. Actually only 92 (8%) of the cases were thus invalidated. This is important because the majority of patients suffering from carcinoma of the rectum are elderly, and often their general condition has been considerably undermined before they present themselves for treatment. In a number of cases no very special cause was present to account for the unsatisfactory state of the patient's general health, and such cases were merely described in the notes as being "in poor general condition." In others, however, some concomitant ailment (such as cardiac disease, chronic bronchitis, emphysema, pulmonary tuberculosis, unstable mental condition, diabetes mellitus, etc.) was noted, or the patient was very obese or elderly. It is to be emphasized, however, that as a rule these conditions constituted a contraindication to operation only when they were of an advanced nature, and not a few patients manifesting lesser degrees of the same conditions successfully withstood radical excision of their growths. Particularly to be stressed is the fact that no arbitrary age limit to operability was observed, as is clearly shown in Table II, which indicates the influence of age on the operability rate in 1,171 cases in which the data were adequate for that purpose.

TABLE II.—Effect of Age on Operability

Age Group	Cases in Each Group	Accepted as Operable	Operability Rate
20-29	25	15	60.0%
30-39	63	42	66.7%
40-49	145	106	73.1%
50-59	351	224	63.8%
60-69	443	260	58.2%
70-79	139	65	47.0%
80-89	5	3	—
All ages ..	1,171	715	61.1%

The optimal operability rate was in the age group 40-49. In older patients the rate declined, but even in the age group 70-79 it was still practically 50%. The importance of a high operability rate in the upper age groups is amply demonstrated by the fact that *more than half (587) of the patients were over 60 years of age.* The lower operability rate in patients under 40 is not connected with the general condition at all; it is explained, as Dukes (1940) has shown, by the fact that in younger patients rectal carcinoma assumes a more malignant form, and by the time the patient comes to the surgeon extensive spread, rendering the growth inoperable, has more often taken place.

### Inoperability due to State of Growth

Having excluded the patients whose general condition was completely unsatisfactory for any form of radical treatment, there were 1,094 cases in which the decision as regards operability rested solely on the state of the growth itself. Of these, 379 were found to be inoperable. The cause of inoperability was the presence of recognizable spread of the disease to points beyond the scope of an excision. This manifested itself in the following ways: (a) by local fixation of the growth (spread by direct continuity of tissue); (b) the presence of hepatic metastases (venous spread); or (c) extensive involvement of the lymph glands or peritoneum (lymphatic spread).

It is important to realize that it is only at laparotomy that an accurate assessment of the operability of a rectal carcinoma can be made. For, in the first place, clinical examination alone gives no reliable information as to venous or lymphatic spread, unless it is very extensive; and, secondly, fixity of the primary growth, as determined by rectal examination, is an untrustworthy sign on which

to base a diagnosis of inoperability. Growths which appear clinically to be fixed and inoperable are often found at laparotomy to possess enough mobility to permit of excision being performed. The explanation of this may be that during a rectal examination it is naturally difficult to impart movement with the finger to a growth that is sometimes so large as almost to fill the pelvis. At laparotomy it may be possible to grasp the growth with the whole hand and to test more exhaustively its range of movement in all directions. Whatever the explanation, however, there is no doubt of the fact, and it is one that thoroughly justifies the practice at St. Mark's Hospital of allowing all "borderline" cases to proceed to laparotomy.

Thus in the present series the decision as regards operability in no fewer than 893 cases (of which incidentally 621, or 69.7%, were operable) was deferred till the abdomen had been explored. In only 201 cases was a conclusion reached on clinical grounds alone; 107 of these were hopelessly inoperable cases (with fixed growths in nearly all, fistulae in 15, palpable enlargement of the liver in 19, ascites in 4, and fixed enlarged inguinal glands in 4), while 94 had apparently inoperable growths, in which confirmation of operability at laparotomy was precluded because the patient refused operation or because the treatment applied was of a restricted nature (e.g., local or perineal excision with "blind" colostomy) not involving exploration of the abdomen.

The part played by each of the three contraindications in determining inoperability will now be examined.

### Contraindications to Operability: (a) Fixation of Growth

Fixation was noted in 261 of the inoperable cases. In 169 of them a laparotomy had been done and a definite opinion as to the presence of hepatic, peritoneal, or lymph-gland metastases could therefore be formed; in no fewer than 97 of these fixity of the growth was the sole cause of inoperability. An incentive is therefore provided for courageous handling of this complication.

The exact situation of the fixation was clearly defined in 174 cases. In 116 of these it was found anteriorly, in 23 posteriorly, and in 14 on the lateral walls; in 33 cases the rectum was fixed on more than one aspect. The enormous preponderance of anterior fixation is interesting, and is entirely in keeping with preconceived ideas on the subject; for it has long been recognized that the anterior aspect is the *face dangereuse* of the rectum. It is of course accounted for by the close application of viscera to the front of the bowel, so that a rectal carcinoma readily becomes adherent to them.

*Influence of Site of Growth on Operability.*—It follows from the above that the site of the growth in the rectal wall ought to have an important influence on its operability. Thus one originating in the anterior wall is early exposed to the risk of becoming adherent to the organs related to this surface, and its operability ought therefore, on the average, to be reduced. This is a danger which does not apply to posterior growths until such time as they have extended circumferentially round the rectum to form completely annular lesions, and their chance of becoming fixed to the sacrum is apparently slight. The operability of growths beginning in the posterior wall should thus be appropriately enhanced. The risk of a lateral growth becoming fixed to the parietes is probably not any greater than that of posterior growths, but the ease of extension to the vulnerable anterior wall would probably slightly diminish the operability of carcinomata arising in this situation. Confirmation of these conjectures is afforded in Table III, which shows the relation between the site of the growth and operability in 1,063 cases in which these points could be correlated.

TABLE III.—Influence of Site of Growth on Operability

Site of Growth		Growths in Each Site	Accepted as Operable	Operability Rate
Completely annular	Male	225	110	48.9%
	Female	112	60	53.6%
	Total	337	170	50.4%
Centred on anterior quadrant	Male	165	66	40.0%
	Female	71	42	59.2%
	Total	236	108	45.8%
Centred on one or other lateral quadrant	Male	165	130	78.8%
	Female	60	47	78.3%
	Total	225	177	78.7%
Centred on posterior quadrant	Male	190	157	82.6%
	Female	75	65	86.6%
	Total	265	222	83.8%

*Influence of Sex.*—Several surgeons have recorded their impression that the operability rate of carcinoma of the rectum is higher in women than in men, and have offered various explanations to account for this difference. A similar variation was observed in the present series; for of 354 women 228 (64.5%) were operable, but of 832 men only 487 (58.5%). It will be noted in Table III that the

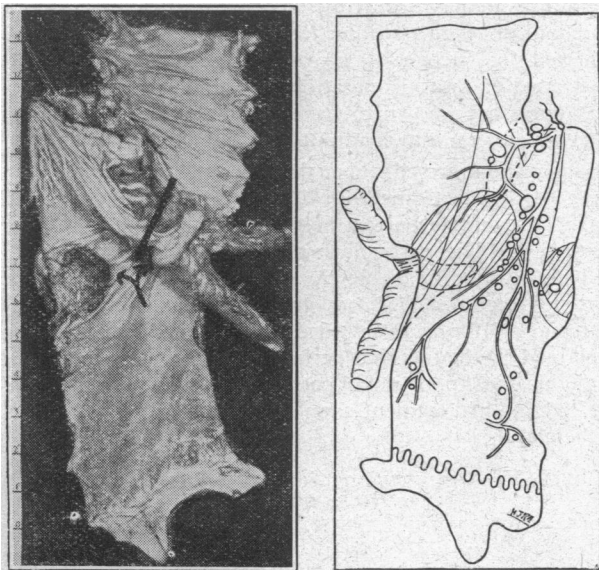


FIG. 1.—Photograph of specimen with lymph-gland dissection from a case of carcinoma recti. A loop of adherent small intestine was removed along with the rectum by perineo-abdominal excision. Histologically the binding adhesion was composed entirely of inflammatory tissue. No lymphatic metastases were seen. The patient unfortunately died with hepatic deposits a year and eight months later.

difference in operability in the two sexes was especially marked in connexion with growths centred on the anterior wall, the higher operability rate for such in women undoubtedly being largely attributable to the greater feasibility, in female patients, of resecting portions of anteriorly related viscera when these are adherent.

*The Nature of the Adhesions leading to Fixation of the Growth.*—Though fixation is brought about by the direct spread of the primary growth, this does not necessarily mean that malignant extension to the adherent structures has occurred. The binding adhesions in many cases are purely inflammatory in character, presumably being formed as a reaction to the advance of the tumour through the rectal wall. Thus a histological examination of 34 operation specimens in which portions of adherent viscera were excised along with the rectum (vagina 20, uterus 3, prostate and seminal vesicles 8, small intestine 3) showed that actual malignant invasion had occurred in only 12 (vagina 5,

uterus 2, prostate and seminal vesicles 3, small intestine 2). The moral to be drawn from these observations is that the prognosis in cases submitted to these extended operations is often very much better than was imagined by the surgeon at the time of the excision. Where the general condition of the patient is good and the additional operative strain is likely to be well borne, therefore, the surgeon should not hesitate to employ these methods as a means of increasing the operability of growths adherent on the anterior aspect of the rectum. Fig. 1 illustrates a specimen removed by such an operation.

(b) Hepatic Metastases

It is naturally only in patients submitted to laparotomy that any accurate data are available as to the frequency of the occurrence of hepatic metastases. Of the 893 cases coming to laparotomy, liver secondaries were noted to be present in 103 (11.5%). It must be pointed out, however, that the surgeon's estimate as to the frequency is subject to fallacy. He can only determine the presence of secondaries on the surface of the organ (and not even all the surface at that!). Growths situated entirely centrally must of necessity elude detection. How grave a source of error this may be is illustrated by the following facts:

From 1930 to 1939 inclusive necropsy was performed at St. Mark's Hospital on 31 patients who had died a few days after perineo-abdominal or perineal excision of the rectum. In all cases a laparotomy had been carried out and the liver surface had been found to be smooth and free from secondary deposits; yet in no fewer than 5 cases secondary growths were discovered in the depths of the liver (see Fig. 2). These figures give an incidence of concealed liver secondaries of roughly 1 in 6 in cases coming to necropsy. If these findings obtain for the other cases which were considered at laparotomy to be free from hepatic metastases (790), then as many as 127 of these may have had such metastases hidden in their liver. The total number of cases with secondary involvement of the liver would therefore be raised from 103 (11.5%) to 230 (25.8%). The significance of these buried metastases is that many patients are inevitably subjected to so-called radical excisions when actually the disease has extended beyond the scope of any such operations and has involved the liver. This fact no doubt accounts in large measure for the frequency with which recurrence in the liver is recorded in the follow-up department in patients dying during the first two or three years after radical operation. In such cases the operation has unconsciously been merely palliative; but, quite apart from the impossibility of avoiding the mistake, the operation has probably justified its performance by the greater relief of symptoms than would have been obtained by colostomy alone.

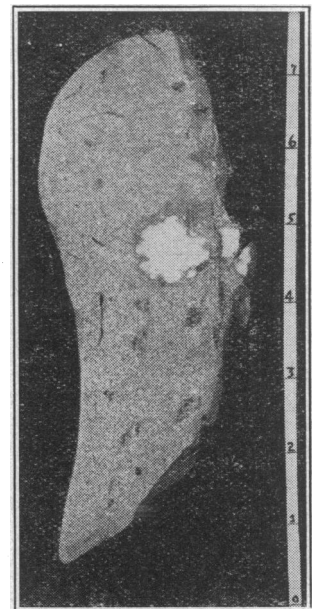


FIG. 2.—Section of liver showing large central metastasis undetected at laparotomy. (From a patient who died one week after a perineo-abdominal excision for carcinoma of rectum.)

In 36 of the 103 cases in which liver secondaries were felt at laparotomy the growth was regarded as locally operable. In 11 of these, as an alternative to colostomy alone, a deliberate palliative excision was performed. In all the 11 cases the patient was in good general condition, and the liver secondaries palpated were very small and usually single, so that, though the liver involvement was almost certainly more extensive than appeared on the surface, that organ was not completely "riddled" with secondaries, and there was a reasonable period of survival to justify the additional risks of this most drastic form of palliation.

### (c) Formation of Peritoneal Nodules and Extensive Involvement of Lymph Glands

These two occurrences represent spread of the growth by the lymphatic system. They were noted in 99 of the 894 cases undergoing laparotomy; in 88 of these cases, however, some other factor, such as fixation of the growth or hepatic metastases, was already present, rendering the condition inoperable. Lymphatic spread cannot therefore be said to play an important part in determining inoperability.

*Peritoneal nodules or plaques* were observed in 62 cases; they were usually confined to the floor or side walls of the pelvis or to the pelvic mesocolon. In 18 cases, however, extensive trans-coelomic spread had apparently taken place, and nodules were scattered throughout the peritoneum, being generally associated with ascites. The presence of any such plaques has in the past been held to contraindicate operation, but recently in a few cases in which the nodules have lain well within the limits of the operation field, and the growth has been otherwise operable, excision has been performed. Sufficient time has not yet elapsed to show whether the attempts at eradication of the disease in these cases have been justified either by success in the primary aim or by the degree of palliation afforded.

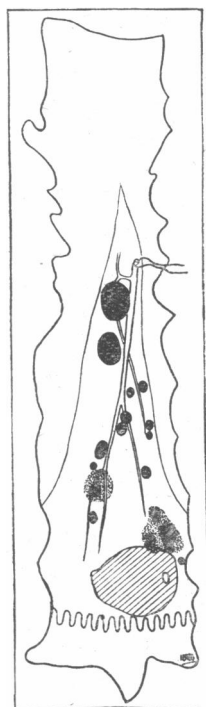


FIG. 3.

The extent of glandular involvement is often a difficult matter to assess even at laparotomy. Gabriel, Dukes, and

Bussey (1935) have shown that 60% of the enlarged glands in association with rectal carcinoma are swollen purely as a result of inflammatory changes. The only cases in the present series, therefore, that were accepted as inoperable on account of glandular involvement were those (57 in number) in which hard fixed enlargement of glands, such as the para-aortic and internal iliac, provided unequivocal evidence of extension of the growth beyond the bounds of legitimate surgical enterprise.

In this connexion it is interesting to note the results of gland dissection of the operation specimens, which was made in 451 cases. In 231 cases lymph-gland metastases were present, and in 81 of these they extended right up to the ligature on the inferior mesenteric vessels, as shown in Fig. 3. That the involvement has extended to a still higher level in most of these latter cases is indicated by the frequent, almost universal, development of early recurrence. Fig. 3 illustrates an operation specimen from one of Mr. Gabriel's cases of carcinoma of the rectum. It shows widespread involvement of lymphatic glands (affected glands

shaded black). The patient surprisingly lived for four years after operation; and finally died of cerebral haemorrhage.

### Choice of Treatment

It will be seen from Table I that a variety of methods have been adopted in the radical treatment of rectal cancer at St. Mark's Hospital. The principle underlying their application has been to employ the most radical operation that the individual patient may reasonably be expected to stand. The method of first choice, at any rate in recent years, has been the combined perineo-abdominal or abdomino-perineal excision. In a number of cases, however, the general condition has not permitted the performance of so severe an operation. It was to patients in this category, with growths of suitable situation and character, that the alternative less drastic procedures were applied. Thus for patients with growths in the lower part of the rectum whose general health has not been good, perineal excision has had a wide sphere of usefulness. Similarly, for growths in the upper third of the rectum it has occasionally been possible to carry out Hartmann's operation when the general condition would have made a combined excision especially hazardous. Finally, for many localized growths of apparent low malignancy in patients in poor condition it has sometimes been possible to use local excision or even radium treatment. Provided they are reserved for such early growths these local removals can be classed as radical operations; in fact, a number of five-year cures are known to have followed their employment. The value of radium is admittedly less clear.

It may be affirmed, then, that the complementary use of these less radical methods in the manner indicated has played a valuable part in helping to achieve a high operability rate. The particular value of the perineal operation is demonstrated in Table IV, which shows that the operability of rectal cancer was greatest when the growth was situated in the lowest third of the rectum, this being explained by the fact that perineal excision was more readily available for "poor-risk" patients whose carcinomata were located in this segment than for those with growths at a higher level.

TABLE IV.—Operability of Growths in Various Segments of the Rectum (1,096 Cases)

	Growths in Each Segment	Accepted as Operable	Type of Treatment Employed			Operability Rate
			Combined Excision	Perineal Excision	Other Methods	
Upper third ..	395	224	161	31	32	56.7%
Middle " ..	314	183	95	74	14	58.3%
Lower " ..	387	273	59	181	33	70.5%
Totals ..	1,096	680	315	286	79	62.0%

### Operative Mortality

The operative mortality for the 321 combined excisions was 60 (18.7%). This figure, however, includes the earliest cases done by this method at St. Mark's Hospital, and is therefore unduly high. The present rate for this operation is just under 10%. The mortality for the 291 perineal excisions was 23 (7.9%). The number of cases submitted to other methods is too small to permit of any accurate statement of mortality. Altogether, of 687 operable cases receiving some form of surgical treatment (including cases whose sole treatment was colostomy or caecostomy) 107 were fatal, giving an overall mortality of 15.6%.

### Summary

The operability of carcinoma of the rectum has been analysed in a series of 1,186 cases.

The operability rate for males was 58.5%, for females 64.5%, and for both sexes 60.3%.

In 8% of the cases inoperability was due to the poor general condition of the patient, and in 32% to the advanced state of the growth.

With regard to age, operability was greatest between 40 and 49, and declined in patients older or younger than this.

Inoperability of the carcinoma itself was determined by the presence of one or more of the following conditions: local fixation of the growth, hepatic metastases, peritoneal carcinomatous plaques, or extensive involvement of the abdominal lymph glands. Laparotomy was usually necessary to decide on the existence of these contraindications.

Local fixity of the growth was noted in 23.9% of the generally operable cases, and in 18.9% of the cases that had laparotomy performed. The fixation was usually in front to the related pelvic or abdominal viscera. Growths involving the anterior wall of the rectum were much less frequently operable than those confined to the other quadrants of the bowel. The operability of anterior growths in women was higher than in men. The adhesions producing fixation were usually, but not invariably, inflammatory in character.

Hepatic metastases were palpable in 11.5% of the cases proceeding to laparotomy. The presence of concealed undetected metastases is postulated in another 14.3% of these cases.

Nodules of growth in the peritoneum or extensive involvement of the abdominal lymph glands were noted in 11.1% of cases submitted to laparotomy. These conditions, however, were seldom the sole cause of inoperability.

In endeavouring to secure a high operability rate the importance of having available several radical procedures of varying severity is stressed.

The operative mortality rate for all operable cases having some form of surgical treatment was 15.6%, for cases submitted to combined excision 18.7%, and for those submitted to perineal excision 7.9%.

I wish to express my thanks to the honorary staff of St. Mark's Hospital for permission to undertake this analysis of their cases, to Mr. H. J. R. Bussey for preparing the photographs of specimens and drawings, and to Mr. W. B. Gabriel and Dr. Cuthbert Dukes for their interest, criticism, and advice.

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## THE PARASITOLOGY OF SCABIES

BY

Professor P. A. BUXTON

*London School of Hygiene and Tropical Medicine*

It seems clear that scabies is increasing among civilians and soldiers. This has resulted in so many people inquiring for details of the life history of the itch mite that I venture to publish this account of what is at present known. I have not dealt with the methods of treating the patient or killing the mite, for it is believed that a summary of that side of the subject is in active preparation by other hands.

The correct name of the mite which causes scabies is *Sarcoptes scabiei* de Geer. There are a number of races which occur on different animals (see below), and that on man is known as var. *hominis*.

### Appearance

The dorsal surface of the adult female itch mite is shown in Fig. 1. The figure is drawn from a specimen from the horse, but this variety is not distinguishable in structure from that occurring in human beings.

The general outline of the itch mite is oval: it is convex above and flat below, and of a dirty white colour, except the brownish bases of legs, etc. The body is divided into two regions by a constriction between the two anterior and two posterior pairs of legs. The greater part of the surface, dorsal and ventral, is covered with fine transverse folds, which are characteristic of *Sarcoptes* (and of certain related genera of itch mites which occur on domestic animals but not on man); the upper surface bears a number of specialized spines and conical scales.

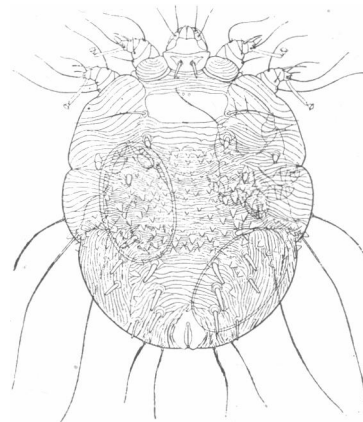


FIG. 1.—Dorsal surface of adult female *S. scabiei* var. *equi*. (From Hirst, 1922.)

The anus is terminal. The legs are short; in the female the first and second legs terminate in suckers (ambulacra) carried on the ends of unjointed stalks; in the male there are similar suckers on the first, second, and fourth legs. The male also differs from the female in the large and elaborate genital organs lying on the ventral surface between the fourth pair of legs. The female is about 0.390 mm. long, the male 0.225 mm.

A full account of the external anatomy of the *Sarcoptes* of the horse (*S. scabiei* var. *equi*) is given by Buxton (1921a). There are grounds for thinking that the mites attacking horse and man are not to be distinguished from one another on anatomical grounds (Buxton, 1921b).

### Biology: 1. Life Cycle

The life history of *S. scabiei* is extremely difficult to follow, for the mites are very small and delicate, and much of the cycle is passed beneath the surface of the skin of the host. The best account that we have is by Munro (1919), but there are many points on which knowledge is still most imperfect. According to Munro the adult female, removed from her burrow in the skin, is capable of burying herself completely in man's skin in a very brief period: she holds to the skin by the suckers of the front legs, and elevates her body into a nearly vertical position by using the long terminal bristles of the hind legs. This is generally done on some part of the human body of which the skin is thin. Once the mite is beneath the skin it rests if the man is in a cold place, and continues to excavate its burrow only if his skin is warm, as when he is in a warm room or in bed; it is when the mite is advancing through the epidermis that the itching is felt. It is assumed that the mites feed on the liquid that is available from the epidermal cells which they crush.

A part of the life history of the itch mite may be observed by opening burrows, or by dissecting them from the underlying tissues and mounting them whole (Fig. 2). It can then be seen that the first egg is laid within twenty-four hours of the female's becoming mature. The egg may