LECTURES

ON THE

RELATIONS OF SARCOMA TO CARCINOMA.

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LECTURE I (*Abstract*).—TUMOURS OF THE TESTIS.

As the first Erasmus Wilson Professor of Pathology under the present conditions of the trust, the duty devolves upon me, which I cannot but regard with pleasure, of expressing, so far as I can do so in words, the feeling of gratitude which must animate all those who are working in the great field of Pathology towards the founder of this chair. The act, generous in itself, is rendered yet more graceful by his permission to deflect the endowment from the purpose to which it was at first devoted to one which cannot, in the nature of things, be so dear to him as the encouragement of his own favourite study of Dermatology. I trust, however, that the impetus which will certainly be communicated to the study of Pathology, and the knowledge that through his means this impetus has been conveyed, may serve in some sort to repay Mr. Wilson for a sacrifice, of which few of us probably could have been capable, but which I think we all can thoroughly appreciate.

At the present time, the anatomical classification of tumours is almost exclusively employed, because it is more scientific than the clinical method, and is more consistent. Of course, it is not perfect, nor can it be said that it fulfils all the purposes for which it was designed. The difficulties in arranging the malignant and semi-malignant tumours still exist; but Waldeyer's (*Virchow's Archiv*, Band 55 (1872), s. 124) theory of the epithelial origin of carcinoma has served greatly to diminish them. I accept this theory without reserve—chiefly because I have myself been able to trace, in certain varieties of carcinoma, the process by which a carcinoma is developed from epithelial cells; and shall therefore define carcinoma to be a tumour of epithelial origin, having generally an alveolar structure, and sarcoma a tumour of connective-tissue origin, formed generally of embryonic tissues and without alveolar structure. For minor differences, the cells of carcinoma generally resemble those of the epithelium from which it grows, there is little intercellular substance, the vessels run in the fibrous tissue, and multiplication of cells is by endogenous formation; on the other hand, sarcoma is composed of round or fusiform or giant cells, and these are packed in a more or less abundant basis, the vessels are often mere fissures between the cells, and the cells increase in number by division. Sometimes sarcoma simulates carcinoma, but the alveolar structure found in some sarcomata is generally discovered to consist of spindle-cells rather than of fibrous tissue. There is, in most cases, no real difficulty in assigning each tumour to its class; but where the origin of a tumour cannot be discerned and the characters which should be distinguishing are not clearly marked, it must be left unclassified.

The objects of the present inquiry are to discover how far the course of a tumour can be predicted from a knowledge of its intimate structure, whether there exists so little or so large a difference as has been asserted between sarcoma and carcinoma, and whether the microscope is likely to be truly useful in a doubtful case. In pursuing these inquiries, I shall adopt a different method from that generally employed, and shall study not so much similar tumours of different tissues and organs as different tumours of the same tissue and organ, by which means possibly a more correct idea may be obtained of their relative course and tendencies. In to-day's lecture I shall compare tumours of the testis, and in the two following lectures tumours of the bones.

The testis may be the seat either of sarcoma or of carcinoma. The former appears to originate in the tissue between the tubules, which for a long time may still be recognised in sections of the tumour. The new growth consists either of round-celled tissue or of trabeculae of spindle-cells; and with either of these may be found fibrous tissue or stellate cells in a viscid basis, or cartilage. Carcinoma, on the other hand, is a growth originating in proliferation of the epithelium of the gland. The process by which this is accomplished has been traced by Birch-Hirschfeld (*Archiv der Heilkunde*, 1868, s. 537), who found that the changes were mainly effected by the filling and dilating of the tubules with epithelial cells. The only variety of carcinoma with which I am

acquainted is the soft form. Probably many of the cases described as hard carcinoma are in truth fibrous sarcomata. The statement of Kocher (Pitha and Billroth's *Handbuch der Chirurgie*, Band II, Abth. 2, Lief. 7-8, s. 346, 1871-75) that cartilage is of frequent occurrence in carcinoma, does not accord with the experience of most authors, and is not borne out in the cases observed and collected by myself, in none of which was there found cartilage. Of the course and characters of most cases of sarcoma and carcinoma a single description might suffice; for, with a few exceptions, there are no means by which we can distinguish between the two diseases. In illustration of their general course, take the following cases.

The first two were examples of carcinoma.

1. A student, aged 21, single, noticed in 1866 a swelling of the testis, of slow growth and without known cause. In March 1867, it was about as large as an egg, tolerably firm, smooth, and without pain. In February 1868, his legs became oedematous, and in May he died. The tumour was nearly as large as a child's head, not ulcerated nor adherent. It presented a good example of encephaloid disease, affecting the epididymis and body of the testis, but a thin layer of gland-tissue still existed on the surface of the tumour. The other testis was sound. The inguinal, pelvic, and lumbar glands were cancerous, the liver was full of cancerous growths, and the lungs contained secondary nodules. This is the case in which Birch-Hirschfeld (*loc. cit.*) succeeded in tracing the development of carcinoma from the tubules of the gland.

2. A dyer, aged 30, married, noticed, two years before admission, that his testis was as large as an egg, but could not account for the enlargement. He was twice tapped before admission, but at the second tapping only blood discharged. The tumour measured fourteen inches and a half round, was oval, smooth, elastic, and slightly adherent to the scrotum. Deep down in the abdomen were firm irregular masses. Castration was performed, and during the operation, twenty ounces of clear fluid were let out. The tumour consisted of a central soft green-coloured substance, surrounded by a firmer substance of the same colour. The epididymis was destroyed with the testis. The microscope revealed an alveolar structure, with large cells resembling the epithelium of the gland. Ten days after the operation, the patient died of peritonitis, but no necropsy could be obtained.

For examples of sarcoma to compare with these, the following may serve.

3. In November 1876, I received a testis which had been the day before removed from a boy aged 6, who had been under observation six weeks, during which time it had increased one-half in size. The date of its origin was not known. The tumour externally was smooth and quite unbroken; on section, white, and almost homogeneous. It consisted of spindle-cells and coarse fibres, with round and oval cells of large size. The boy recovered from the operation, but, in July of last year (1879), he died with a large mass, of about two years' growth, in the abdomen, reaching from the groin to the ribs, and a smaller and more recent tumour in the situation of the spleen. Unfortunately, no *post mortem* examination was performed.

4. A wood-sculptor, aged 57, was castrated in February 1876. For seven or eight years previously, the testis had been enlarged, but its growth had been rapid only during the last six months. It felt like a large kidney. On section, its upper part was firm and white, its lower red and lobed. Examined with the microscope, it consisted almost entirely of adenoid tissue. In September, the patient died. The cicatrix of the operation was indurated; new growth separated the structures of the cord; the remaining testis was enlarged and hard; the groin and pelvic glands were infiltrated; and growths existed in the sternum, vertebrae, and skull, and in the subcutaneous tissue.

In many points, these tumours differ widely, but they present certain points in common; and, if a larger number of cases be compared, it will be found that the points of resemblance are more numerous. Thus, their histories, and characters before and after removal, are often precisely similar, and social conditions appear to exercise but little influence. Regarding the characters in which they differ, I think it will be found that the cases of sarcoma differ more markedly from one another than do the cases of sarcoma from those of carcinoma. Unfortunately, I have not an equal number of cases of each disease to compare together, and, still more unfortunately, a large proportion of the few cases of carcinoma here collected is incomplete. Of these sixteen cases, although eight are known to have died, complete necropsies were performed only in three, and a partial section in one. Again, the total duration of disease in some of the eight patients who died is uncertain, for two died from the effects of the operation of castration, and the duration of another case up to the time of operation is unknown. Yet it is possible to ascertain some important points which I now may shortly indicate. There is only one patient under twenty years of age, a child of two years. Although after twenty years no age was free from

its occurrence, the disease was most frequent between the ages of thirty and forty, or thirty and forty-five. It never affected more than one testis; the tumour was unmixed with other tissues. Affection of the glands was found in every case in which the abdomen was opened, and was strongly suspected in another patient. In two of the three complete necropsies, the lungs and liver were the seat of secondary growths; in the remaining case, these organs were exempt, while the suprarenal capsule was diseased.

not diseased in every case in which examination was made, but were enlarged and sarcomatous in nine of twelve cases in which the abdomen was opened, and the supposition of their enlargement was so strong in two other cases as to amount almost to certainty. Secondary growths occurred in the lungs in more than half the cases; in the liver, only in a single case. The bones or skin, or both, were affected in five instances. If, now, instead of thus comparing all the cases of sarcoma with those of carcinoma, we compare separately the round-celled and

CARCINOMA TESTIS.

No of Case.	Age.	Cause.	Duration before Operation.	One or both Testes.	Affection of Scrotum.	Condition of Cord.	Part of Testis Affected.	Tumour, Simple or Mixed.	Total Duration.	Recur-rence in Stump.	Affec-tion of Glands.	Lungs.	Other Parts of Body.
1	50	Blow in perinæum.	15 months	1	Adherent	Thickened	All	Simple	—	—	—	—	—
2	30	o	24 "	1	"	Thickened	Body	"	24 months	—	? Yes	—	(No post mortem)*
3	49	o	36 "	1	"	o	All	"	42 "	—	—	—	(No post mortem)
4	24	Kick	16 "	1	o	o	All	"	—	Yes	—	—	—
5	34	? Blow	14 "	1	o	o	Body	"	—	—	—	—	—
6	39	o	6 "	1	—	Thickened	All	"	7 months	—	—	—	(No post mortem)*
7	38	—	6 "	1	—	Thickened	All	"	—	—	—	—	—
8	35	—	—	1	—	—	—	—	—	—	—	—	—
9	55	—	48 "	1	o	Thickened	All	"	?	Yes	Yes	Yes	Liver; right breast
10	2	—	3 "	1	—	—	All	"	24 months	o	—	—	(No post mortem)
11	21	o	No operation	1	—	Thickened	All	"	? 18 mos.	—	Yes	Yes	Liver
12	54	? Friction	11 months	1	—	o	Body	"	—	—	—	—	—
13	45	—	15 "	1	Ulcerated	—	Body	"	24 months	o	Yes	o	Suprarenal capsule
14	38	—	36 "	1	Adherent	Thickened	Body	"	36 "	o	Yes	—	(Partial post mortem)
15	72	—	18 "	1	—	—	All	—	—	—	—	—	—
16	42	Squeeze	24 "	1	o	o	All	—	—	—	—	—	—

SARCOMA TESTIS.—Round-celled.

No of Case.	Age.	Cause.	Duration before Operation.	One or both Testes.	Affection of Scrotum.	Condition of Cord.	Parts of Testis Affected.	Tumour Mixed or Simple.	Total Duration.	Recur-rence in Stump.	Affec-tion of Glands.	Lungs.	Other Parts of Body.
1	35	o	7 months	1	o	(?)	Body	Simple	13 months	o	—	—	(No post mortem)
2	19	o	5 "	1	o	(?)	All	"	—	—	—	—	—
3	10	o	No operation	2	o	—	"	"	24 months	—	Yes	o	Subcutaneous tissue, bones
4	51	Friction	36 months	1	—	o	"	"	—	o	—	—	—
5	50	—	1 "	1	—	—	Epididymis	"	5 months	o	o	Yes	Liver, skin
6	61	—	66 "	1	o	o	All	"	—	—	—	—	—
7	64	? Strain	2 "	1	o	—	Body	"	—	—	—	—	—
8	57	—	12 "	2	o	Thickened	All	"	21 months	Yes	Yes	o	Bones, subcutaneous tissue
9	57	—	12 "	2	o	Thickened	"	"	42 "	—	—	—	(No post mortem)
10	3	—	13 "	1	o	(?)	Body	"	24 "	o	Yes	o	o
11	5	Bruise	3 "	1	o	o	All	"	12 "	o	—	—	(Partial post mortem)
12	34	o	2 "	2	—	o	—	"	—	o	(?)	—	Bones
13	8 mos.	—	No operation	2	o	—	Body	"	2 months	—	o	o	Bones, heart, subcutaneous tissue, penis
<i>Spindle-celled.</i>													
14	10 mos.	—	4 months	1	Ulcerated	—	All	—	—	—	—	—	—
15	25	—	(?)	1	—	—	"	Cartilage	—	—	—	—	—
16	34	o	3 months	1	o	o	"	"	—	—	—	—	—
17	6	—	3½ "	1	—	o	"	Simple	33 months	o	? Yes	—	(No post mortem)
18	26	o	14 "	1	o	Thickened	"	Cartilage	24 "	Yes	Yes	—	Kidney
19	40	Bruise	8 "	1	—	o	"	"	36 "	o	—	Yes	—
20	45	? Blow	3½ "	1	o	o	Body	"	—	—	—	—	—
21	40	—	—	1	—	o	"	Simple	(?)	o	—	Yes	—
22	45	o	72 months	1	o	—	"	"	—	—	—	—	—
23	37	Bruise	24 "	1	o	Thickened	"	Cartilage	30 months	Yes	Yes	Yes	—
24	10	o	5 "	1	o	o	All	Simple	36 "	o	? Yes	—	(No post mortem)
25	4	o	1 "	1	o	o	"	Cartilage	7 "	o	Yes	Yes	Spleen
<i>Mixed Tumours.</i>													
26	40	o	72 "	1	o	—	All	Simple	72 months	—	—	—	(No post mortem)*
27	40	Blow	48 "	1	—	—	"	Cartilage & Mucous tiss.	—	—	—	—	—
28	40	o	No operation	1	o	Thickened	"	Mucous tiss.	2½ months	o	o	Yes	Interior of heart

* Died from causes connected with the operation.

The cases of sarcoma are twenty-eight in number. Most of them are round-celled; only three such as can be classed with neither of the first two groups. Of these twenty-eight cases, we have records of the deaths of seventeen; and on these seventeen subjects, eleven complete necropsies were performed, while in one case the abdomen only was examined. The disease was most frequent at two periods of life, the first period extending from birth to ten years old, the second corresponding with the period during which we have just found that men are most liable to carcinoma. I do not pretend to explain why both classes of tumour occur so frequently during the third decade of life, a time during which inflammations of the substance of the testis are perhaps less frequent. But I imagine before the age of ten, two causes concur to render carcinoma rare; first, the little liability to cancerous degeneration of epithelium of any part at so early an age; second, the inactive condition of the epithelium of the testis before the age of puberty. Both testes were occasionally affected by sarcoma. Many of the tumours were mixed with cartilage or other tissues. The glands were

the spindle-celled tumours with the carcinomata, the results are more striking.

The round-celled tumours occurred in persons of age between eight months and sixty-four years, but most often before the age of ten or between fifty and sixty years. Both testes were not infrequently affected. None of these tumours contained cartilage or any organised tissue other than fibrous. Glandular affection was absent in two of the six cases in which necropsies were performed, and the lungs were the seat of secondary growths only in a single instance; yet in five cases there was widespread generalisation in the bones and skin or subcutaneous tissue. And with the skin the liver was in one patient affected. Several of these round-celled tumours, especially in those cases in which both testes were affected and generalisation was extensive, were examples of what has been called lympho-sarcoma or lymphadenoma of the testis, on account of the delicate reticulum which can be discerned amid the cells.

The subjects of spindle-celled sarcoma were from ten months to forty-

five years old; but the disease was far most frequent in patients under ten or from thirty-five to forty-five. In no case were both testes affected. Cartilage was present in greater or less quantity in more than half the cases. The total duration of disease was rather longer in patients with spindle-celled than in those with round-celled sarcoma; several of the former lived three years; most of the latter only two. Affection of the glands occurred in every case in which the body was examined after death, and in two cases in which no examination could be made a like affection was indicated by the presence of a large tumour in the pelvis and abdomen. The lungs contained secondary growths in every case but one, and in that case a large tumour occupied the situation of the kidney. In no instance was there extensive generalisation similar to that occurring in the fatal cases of round-celled tumours.

A summing up of the chief differences shows that, apart from those of structure and of age of occurrence, they are for the most part differences in the manner of their generalisation. One noticeable feature is the absence of glandular affection in three cases of sarcoma, which may perhaps be explained by their extremely short duration. In two of the cases, this was only about two months; in the third case, five months. With one exception, all the other fatal cases were of more than a year's duration. One cannot but think, therefore, that these three patients died ere sufficient time had elapsed for glandular affection to be developed.

In connection with the frequent occurrence of cartilage in spindle-tumours, let me draw attention to the so-called malignant enchondroma of the testis, cases of which are related by Paget (*Medico-Chirurgical Transactions*, vol. xxxviii, 1855, p. 247), Dauvé (*Mém. de la Société de Chirurgie*, tom. vi, p. 291), and De Morgan (*Pathological Transactions*, vol. xvii, p. 182, and vol. xx, p. 331). In the first two, the primary tumour consisted in each case of nodules, tubes, and cylinders of cartilage, and of softer masses without cartilage in the spermatic cord. In each case, death occurred from secondary affection of the glands, with, in the former, large growths in the lungs; but in the latter a suppurating tumour of the kidney. In Paget's case, the secondary growths were mainly cartilaginous; in Dauvé's, they contained cartilage, but only the smallest quantity. De Morgan's patient died two years after the removal of a cystic tumour of the testis, in which were small plates and patches of cartilage. The glands and lungs were the seat of secondary tumours, which contained more cartilage than the primary disease, but were chiefly formed of spindle-cells.

The first two of these cases are such as would generally be termed enchondroma; but the third is a cystic tumour containing cartilage, and ought not to be described as a cartilaginous tumour. Yet I believe all three are of the same nature, and should be regarded as sarcomata, not as enchondromata; for cartilage and sarcoma tissue both belong to the connective-tissue series. The material from which one of them is formed may equally be transformed into the other. But, even when this occurs so largely that most of the tumour is composed of cartilage, the course and tendencies of the growth are not proportionately affected. It is still a sarcoma, the characters of which are altered, but whose course remains unchanged. The description of these three tumours shows that neither of them consisted solely of cartilage. Each had a softer part, consisting of spindle-cells, or "fibrous elements", or "connective tissue". This soft tissue extended up the cord in the first two, and in the second and third cases formed nearly the whole of the secondary growths. Compare these cases, first with one of pure cartilaginous tumour, and next with those of the group of spindle-tumours, among which I have taken the liberty to include them as Nos. 18, 19, and 23. Here is an example of pure cartilaginous tumour, of small size, and containing no softer tissue except a thin layer of fibrous tissue around and between the portions of cartilage. It had been growing four years in a man twenty-two years old. Castration was performed in 1875, and less than a year ago the patient was quite well. On the other hand, the age of these three patients is that at which sarcoma frequently occurs; and they agree with the sarcomata in their relation to the scrotum, their position in the testis, their total duration, and their affection of the lymphatic glands.

On the question of operation in cases of sarcoma and carcinoma, I can say but little. As the operation of castration is not very dangerous to life, and as the disease is probably certainly fatal unless interfered with, the balance of opinion must be decidedly in favour of castration, especially as the good health of a few fortunate persons is recorded long after operation.

PRESENTATION.—On recently resigning the office of medical officer to the West Derby union workhouse, Mr. W. O. Deacon was presented by the officials, patients, and nurses of the workhouse with a gold chain and locket, a silver-mounted meerschaum pipe and case, and an inkstand, together with an address.

SECOND AND THIRD SERIES OF TWENTY-FIVE CASES OF COMPLETED OVARIOTOMY.

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WHILE my last paper was awaiting publication, a case illustrating another of the disadvantages of the clamp came under my notice. The patient was sent to me to have a second ovarian tumour removed, and gave the following history. Six years ago, she underwent ovariectomy in one of the general hospitals, and made a good recovery. The pedicle was secured by a clamp, which came away in about a week. Last years when with child, she entered another hospital, and was supposed to be suffering at the same time from ovarian disease. She was advised to get through her pregnancy before having anything done. Two months, before applying to me, she was confined; the labour was rather tedious. She complained to me of pain and a sense of dragging in the left side, and said she had a small tumour in the hypogastrium. On examination, I found a globular swelling there with the line of the cicatrix very much stretched laterally, passing upwards over it. This tumour was as large as the head of a child about a year old. Careful palpation led to the diagnosis of ventral hernia. At the lower end of the cicatrix, there was some thickening, with a dull sound on percussion. The vagina was funnel-shaped, and the uterus was drawn up to such an extent that I could only just reach the os, and direct the point of the sound into it. (There was nothing abnormal in the form of a tumour in the pelvic cavity.) Although I depressed the handle as much as the perinæum would allow, I could not introduce more than an inch and a half. I then pressed the hypogastric swelling backwards and downwards, and immediately I felt the cervix descend and the body of the uterus slip over the instrument until its point could be felt close under the external hand. The case was now quite clear. The pedicle had evidently been a very short one, so that the fundus of the uterus was closely applied to the parietes. In course of time, the recti muscles had become separated, and what may be termed a hernia of the uterus was formed. Now, cases of ventral hernia after ovariectomy are by no means rare, and especially after the use of the clamp. I have seen several. It is one of the things also which may happen after the use of the drainage-tube. It has occurred in two of my cases. The first was a very severe operation (No. 11) requiring drainage, and the accident might be owing to a variety of causes, viz., first, the separation of the muscles by the tube; second, the early removal of the sutures (silk) to avoid suppuration; and, third, the getting up of the patient too soon—viz., on the eleventh day. In the second case (No. 21), I could only attribute it to the early removal of the sutures (likewise of silk) which were beginning to produce irritation. Yet it had no unfavourable influence on her subsequent labour with twins, under two years after the operation. These two cases occurred, as I have indicated, in the days when I used silk. Then the sutures were generally taken out within the week, most frequently about the fifth day. If they were left longer, there was more or less irritation in their tracks, and sometimes distinct suppuration, or even a small abscess. Although I have always been in the habit of including in the loop of the suture the peritoneum, the muscular aponeurosis, and the whole thickness of subcutaneous connective tissue and fat; yet, while using silk, I have felt that support was not given for a sufficient length of time to ensure thorough union of all the parts. Now that I use the silkworm gut, I have no fear on this score. I never take the sutures out under ten days, and often leave them for a fortnight. This is a matter of great importance when the drainage-tube is used. By leaving the sutures in for some days after the tube is removed, a firm cicatrix is ensured.

I first employed the silkworm gut in my twenty-seventh case, and then only for the sutures on each side of the drainage-tube. The remaining sutures were of silk, and, on the fifth day, there was a small red circle around each of their openings, while the gut punctures presented no trace of irritation. In my next case, I used five silkworm gut sutures and two silk, the latter at the top of the wound. A small abscess formed in the track of these, and they were removed on the fourth and fifth day. The gut sutures, on the contrary, were so far from producing irritation that they might have been left in much longer. I feared, however, that the mischief might extend to them, and the test was sufficient. From that time I have exclusively used the silkworm-gut for sutures. I find that many surgeons are not aware of the difference between this material and catgut. There is nothing in common between them. The catgut softens, swells up, and melts away in the course of a few days, whereas the silkworm-gut remains unaltered for