ON THE
CAUSES OF HERNIA.

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THE apology for reviving so well-worn a subject is the belief that hernial pathology has not yet found its stable equilibrium. The opinions which obtained up to the end of the last century have given place to a more purely mechanical interpretation; and as this interpretation is being made the basis of treatment, it seems important to test its validity. It is with this view that the writer ventures to submit to the Society the following considerations.

The prevailing view of the causes and nature of hernia—that of Scarpa and his followers—may, for convenience, be called the “mechanical;” the other, of which Richter was the most famed exponent, may be called the “pathological.” The supporters of the “mechanical theory” assert that the abdominal viscera are maintained in their several positions by the pressure of the muscular parietes, and that the mesenteries, ligaments, and peritoneal folds, are nutritive attachments rather than mechanical supports; that the intestines are normally prone to displacement, and that hernia depends upon a loss of balance between the muscular power of the parietes and the resisting power of the fibrous fabric of the inguino-crural aponeuroses.

The advocates of the "pathological" theory, on the other hand, maintain that the intestines (with certain exceptions, that need not now encumber the argument) are not prone to displacement in the normal and healthy condition of the mesenteries, ligaments, and peritoneal folds. They agree that the protrusion is the result of the mechanical action of the muscular parietes, but hold that the intestines do not come within the sphere of that expulsive action until they have descended somewhat in the cavity of the abdomen, either by relaxation, hypertrophy, or other lengthening of their attaching membranes.

Richter¹ argues that such elongation is a necessary precursor of protrusion. Scarpa,² on the contrary, asserts it to be merely a consequence, or, at the least, a concomitant, of protrusion, due to the dragging of the protruded viscus. Malgaigne³ affirms that inguinal hernia can take place without any lengthening whatever of the mesentery, either previous or concomitant; and there are many recent writers of the same opinion. But there is no need to regard them now.

Scarpa denies the necessity of relaxation simply on the strength of an assertion which he fails to prove. He says that the ligaments of the viscera are not strong enough to support them *in situ*. The fact that the liver, the weightiest of all the viscera, is sometimes lacerated by the resistance of its own ligament under the shock of a suddenly arrested fall, countervails his assertion.

Malgaigne,⁴ too, deals very lightly with the same subject. The veriest tyro, he says, knows that the mesentery will allow the intestines to pass beyond the walls of the abdomen; but he forgets to state what part of the walls, or how much of the intestine.

Cloquet⁵ rested his elaborate argument on the fact that

¹ French translation, by Rougemont, p. 10.

² Translation by Wishart, p. 44.

³ 'Leçons Cliniques sur les Hernies,' pp. 29, 30.

⁴ Op. cit., p. 29.

⁵ 'Recherches sur les Causes des Hernies Abdom.,' 1819.

hernia is more frequent on the right side of the body than on the left. Malgaigne¹ showed that hernia on the right side was very frequent in left-handed persons, and *vice versa*, and so upset his conclusions. Out of 374 male cases of hernia (inguinal), interrogated consecutively as they came under notice at the City of London Truss Society, in the year 1860, 350 were right-handed persons and 24 left-handed. Of the 350 right-handed patients, 201 were ruptured on the right side and 132 on the left, while in 17 the hernia appeared on both sides simultaneously. Of the 24 left-handed, 13 were ruptured on the right side and 11 on the left. This confirms Malgaigne's objection; but the tables² of the Truss Society, just mentioned, show more than this. It is true that, in the aggregate of all classes and every age, the right side is more often the seat of hernia than the left (nearly one third); but it is interesting to observe that the age to which Cloquet's arguments are intended to apply, namely, the period of full manhood, happens to be that during which the two sides are more equally affected. During the first few months of life the lesion occurs on the right side three times oftener than on the left. This disparity lessens as puberty and manhood approach. As the bodily powers decline, right ruptures become more frequent. Nor is this all. Hernia occurs on the right side eight times oftener during the first year of life than during any subsequent year; and when the fullest allowance is made for the excess of infant population over the adult,³ still the first year of life will be found to afford more than four times the number of patients with right ruptures than any subsequent year. It is clear, then, that there must be some other cause than muscular exertion to

¹ 'Leçons Cliniques,' &c., 1841, p. 32.

² See Table appended.

³ The following is obtained from the Census of 1851 :

Males under one year	289,371
„ between one and five	887,382
„ between twenty-five and thirty	617,889

Compare this with the Table appended to this paper.

bring about this predominance of right over left hernia. Wrisberg and Camper found an explanation of it in the more tardy closure of the right tunica vaginalis testis. This interpretation is accepted by Malgaigne.¹ It fits in with the tables of the Truss Society, and is generally admitted.

Labour has been thought to favour the "mechanical" theory. The statistics of the Truss Society do not confirm this. During three successive years the occupations of the male patients who came for relief to the City of London Truss Society were carefully noted down, and the list, showing the number of patients of each occupation, has been compared with a list taken from the General Census of 1851.² The result is that (with certain exceptions, which enhance

¹ Op. cit., p. 48.

² The following is the list alluded to :

TRUSS SOCIETY.

(The society is situated in the heart of the Metropolis.)

ORDER IN CENSUS 1851.	1859.	1860.	1861.
Farm Labourer	—	171	173
General Labourer	*776	†553	†734
Boot and Shoe Maker	38	53	72
Carpenter and Joiner	‡173	‡178	99
Tailor	20	33	28
Domestic Servant (male)	101	176	131
Silk Weaver	63	71	58
Blacksmith	48	51	63
Mason, Pavior	—	18	—
Messenger, Porter, &c.	478	410	351
Gardener	65	119	114
Bricklayer	—	—	49
Butcher	53	52	52
Painter, Plumber, &c.	33	45	50
Baker	35	69	52
Carman	73	87	82
Clerk (Commercial)	29	30	65
Cabinet Maker	—	—	41
Bargeman	—	44	35
Sawyer	35	34	29
Rail Labourer	—	—	—
Hawker	33	57	37
Wheelwright	10	—	18
Printer	36	51	42
Cooper	20	32	23

* Including farm labourers, bricklayers, and rail labourers.

† Including masons, paviors, and rail labourers.

‡ Including cabinet makers.

rather than disparage the conclusion) hernia occurs oftenest in the most numerous classes, and not in the most laborious, except in so far as they are also numerous. The exceptions are shoemakers and tailors. These, being essentially sedentary callings, might be accepted, as favouring the mechanical theory, were it not for the following circumstances:—1st. The fact of the work not being such as to elicit an early manifestation of the malady, even though a predisposition be latent. 2ndly. When produced, the hernia does not so imperatively demand mechanical support; patients of these trades being apt to neglect this protection altogether, or to postpone its adoption. 3rdly. When once a truss has been adjusted it will last three or four times longer than one worn by a labourer who sweats, and therefore so frequent an application to the Society is not needed.

A comparison of the sexes of hernia-patients is also thought to favour the mechanical theory, because males apply for relief so much more frequently than females. But here, again, the arguments are not at all conclusive. In the first place, the disparity is not so great as at first appears. Women make their trusses last more than twice as long as men. They dislike the ordeal of examination and adjustment, and put off their applications for relief till pain or apprehension compel it. Malgaigne,¹ whose statistics are very reliable, calculated the proportion to be four males to one female. The tables of the City of London Truss Society indicate a proportion of five to one. But it is likely that Cloquet's² estimate of two to one is the most near the truth, since he deduced it from dissection. The two former were drawn from the patients of charitable institutions; and although in each calculation care was taken that none should be counted a second time, yet, as

¹ 'Leçons Cliniques,' &c., p. 12 :

"En 1836, sur 2767 hernies, 2203 hom., 564 fem. = 4 à 1.

" 1837 „ 2373 „ 1884 „ 489 „ = 3.89 à 1.

" De ces trois colonnes de chiffres il faut conclure le rapport de 4 à 1."

² 'Recherches sur les causes, &c., p. 3, note : "Des 457 cas de hernies que j'ai disséqués, 307 appartenait à des hommes, 150 seulement à des femmes."

they are based upon annual reports, it is needful to make further allowances: for example, if men wear a truss one year, women will wear one nearly three years. It is clear, then, that in an annual report the number of males (even though never counted a second time, of which there must always be some chance) will be unduly swelled in proportion to the other sex. The number of males should be at least halved to express the proportion with any fairness. This would establish Cloquet's estimate. If vaginal enterocele, prolapsus of the pelvic viscera, and umbilical hernia be taken into the account, the disproportion between the two sexes will be still further lessened.

Popular belief, however (which generally has truth for its foundation), is decidedly in favour of the mechanical theory. There can be no question that the prevailing notion is that a "rupture" is the consequence of some violent effort. Under this preconception, patients are apt to attribute the cause to any memorable shock, or violence, next preceding the discovery of the swelling, whether the interval be measured by minutes, days, or months. But the connection is seldom clear. It is not common to obtain clear testimony of violent exertion during the day being followed by discovery of the swelling at night, and still more rare is it to get satisfactory evidence of hernia ensuing as a direct and immediate consequence (without any previous sign) of such violence, and yet this is sometimes, though very rarely, afforded. For instance, when the tunica vaginalis testis¹ remains patulent, hernia has been said to occur suddenly and fill the scrotum without the patient having had any previous sign or warning of it. Some cases of direct hernia have been known to descend rapidly into the scrotum, but not with the suddenness of the so-called "congenital hernia." Cases of this kind are so rare as to be quite exceptional; and, even if they were not so, they could not be quoted against the pathological theory, but rather in its favour, as will be seen hereafter.

¹ *i. e.* The vaginal process of the peritoneum.

The great majority of patients never pretend to give any definite account of the mode in which their hernia was produced, although they often volunteer a theory. Out of 700 adult males, interrogated consecutively as they presented themselves at the City of London Truss Society, only 48 attempted to assign a special cause. Cough is the cause of its *discovery* in most cases. Many learn their condition for the first time from medical examination. Women not rarely come with irreducible femoral epiplocele, the existence of which has just been made known to them by their "doctor;" sometimes they will confess that they know nothing about its formation, and sometimes they insist that it was produced by some quite recent exertion, accompanied with pain at the spot. Indeed, the patients' accounts of the causes are generally so vague and so various that it has been found impossible to tabulate them. Effect is sometimes given as a cause—the retching and vomiting of strangulation, for instance. "Sneezing" has been accused of producing it, and even "stooping to wash a child's head." Rising from bed, after a protracted illness, has several times been given as a cause. In fact, so far as the investigations upon which this paper is based are concerned, there is no evidence whatever to show that muscular exertion in health, and by itself, is ever a cause of hernia.

When the essential conditions exist, muscular effort unquestionably effects protrusion. Of this there can be no doubt. All that is claimed in this paper is, that the part protruded must first come within grasp of the protruding power; and that in the normal and healthy condition of the peritoneum in its entirety the viscera do not come within such grasp.

If it were otherwise, if the intestines were always in a condition ready for protrusion as soon as a fault in the parietes allowed it, it must of necessity follow that whenever the tunica vaginalis remains sufficiently patulent hernia must invariably occur. But it is well known that this is not invariably the case.¹ In the autumn of 1859 Mr.

¹ A gamekeeper, æt. 24, applied to the Truss Society with hydrocele

Stanley removed a cancerous testicle from a patient in St. Bartholomew's Hospital. During the operation it was found that the tunica vaginalis and the peritoneum formed together one continuous cavity. The communication was free enough to admit the finger easily within the serous cavity of the abdomen. Yet there had never been any hernia before the operation; nor, when the man left the hospital with a sound cicatrix, was there any unusual impulse to be felt at the ring. Such cases, though rare, are not unknown to surgeons.

Among females, too, the diverticula of Nuck are acknowledged, even by Malgaigne,¹ to be as often open as the tunica vaginalis, yet hernia is less frequent. Mr. Lawrence² says of them, "it has not been ascertained that these diverticula become closed, . . . nor have we reason to believe that their presence favours the occurrence of hernia."

And then, again, if the mechanical theory were the true and sufficient explanation, we should naturally expect to find that a hernia, once formed, would go on increasing in magnitude indefinitely. But this is not so. Hernia will sometimes remain for years stationary, just beyond the outer ring, without any mechanical support, and only begin to inconvenience the patient when some debilitating illness supervenes. Then at once it will begin to descend into the scrotum, and go on increasing to an indefinite size, and then for the first time awaken the patient to a sense of its importance. It is clear, then, that parietal integrity is not the only hindrance to the descent of the viscera.

The opinion of surgical writers (almost without exception),

and ascites. The hydrocele had been mistaken for hernia, because it disappeared when the patient was recumbent. There could be no doubt that the fluid in the two cavities was the same, because fluctuation was distinctly communicated. The two swellings (of abdomen and scrotum) appeared together a few months before his application. There was no previous history of hernia. The tunica vaginalis, in this case, no doubt formed one continuous cavity with the peritoneum.

¹ 'Leçons Cliniques,' p. 14.

² 'Lawrence on Ruptures,' 5th edit., p. 578.

up to the time of Scarpa, was that the mesenteries and suspensory ligaments of the viscera constituted that hindrance, and there is much to favour this view. The altered contour of the belly in ruptured persons favours it—the unnatural fulness of the iliac fossæ, with sinking of the epigastrium and prominence of the hypogastric region. This deviation from the normal figure of the abdomen is the rule in patients of adult life. It seems to be less pronounced in cases of (so-called) congenital hernia, *i. e.* hernia into the tunica-vaginalis.

Rokitansky¹ distinctly attributes internal hernia to a “long, flabby mesentery.” He purposely avoids treating of external hernia as belonging exclusively to surgical writers; but he evidently associates the two. And it is worthy of remark, that internal strangulation seems to be associated with a family tendency to hernia, a coincidence suggestive of more than accidental affinity between the two forms.

When the cæcum constitutes the hernia it is manifest that its attaching membrane must have been excessive prior to its protrusion, as it is not possible for any force of the muscular parietes to dislocate it from its place in the normal disposition of its peritoneal covering.

The sigmoid flexure of the colon is less regular in its attachment; it is sometimes of considerable length, and has a mesentery of its own; but this condition is so far from being common that, when it forms the contents of a hernia, its protrusion may fairly be said to be due to an unusual length of its attaching membrane.

But the small intestines, it is argued, are subject to no such restrictions. Their mesentery allows them so free range in the abdominal cavity as to permit their ready escape without stretching. This is said to be demonstrable by experiment. It is partly true. The lower coils of the small intestines do unquestionably occupy the pelvic basin, in the empty state of the bladder, and lie against the abdominal parietes in the inguino-crural regions. But it is only a limited portion of

¹ Sydenham Society's transl., vol. ii, p. 52.

the small intestines that has this reach. The major part hangs higher in the abdominal cavity, above the lower edge of the associated muscles. Nor does it appear that there is any force available to alter their position.

Nestled in amidst the large intestines and the stomach, they hang from the lumbar prominence of the spine (the stable centre of every movement of the body), almost uninfluenced by attitude in their relation to the inguinal and crural openings.

Their position determines the curve of the abdominal muscles, and so directs the resultant of their forces. So long as that is parallel with the radius of the mesentery, the intestines are secure from displacement from that source; and whatever downward pressure can reach them must first pass through the gas contained in the ample chambers of the larger gut.

If, however, some such hypothesis as Richter's be accepted—which presupposes laxity or elongation of the mesentery, together with general laxity of the peritoneum—all the difficulties will disappear. The subject will then come within the scope of Scarpa's argument. By descending in the abdominal cavity the small intestines will alter the contour of the parietal muscles, and change the focus of their forces. The long fibres of the transversalis will ply above them, and drag on the mesentery. The weight of the intestines, apart from the force of parietal compression, will fall on the inguino-crural regions, the most dependent part of the abdomen. Every jolt and motion of the body will add to the pressure. Then will occur that loss of equilibrium so much emphasised by Scarpa and Cloquet, and it will become almost a matter of necessity that, sooner or later, the weakest part must yield. Under these circumstances any unusual exertions may act as "the last feather," and either, in reality, bring about the protrusion, or, at least, so far increase it as to be credited with the entire blame.

But it is not only in its mesenteric duplicatures that a laxity of the peritoneum leads to hernia. Its parietal layer

determines the species by directing the channel of escape. It used to be said that the chief "predisposing cause"¹ of hernia lay in the naturally greater size of the openings at which they protrude, "since in males, where the abdominal ring is naturally capacious, inguinal herniæ occur in great numbers, while the femoral species is rare; females, on the contrary, having the capacity of these apertures reversed, are seldom affected with inguinal hernia." But there is fallacy in this.

In the first place, it is clear that the size of the aperture (*i. e.*, the fibrous aperture, for the argument supposes there is no real opening before protrusion) cannot cause the lesion, since it has been shown that an opening may remain permanently gaping to receive one, and no protrusion pass. The condition of the aperture may determine the species, but it cannot produce the complaint.

In the second place, it is not a fact that "the inguinal variety is rare in females." The two varieties (namely, inguinal and femoral) are nearly equal. Malgaigne thinks the inguinal form the more frequent.² The tables of the City of London Truss Society make femoral hernia rather exceed the other.³ But Malgaigne's estimate is probably

¹ 'Lawrence on Rup.,' 1st ed., 1807, p. 7; and 5th ed., p. 44; 'Teale on Abd. Hern.,' 1846, p. 40 and 41; Cloquet, and others.

² "J'étais, et je suis encore d'avis que les hernies inguinales sont plus communes chez les femmes que les crurales." 'Leçons Cliniques,' p. 174.

³ The following condensed analysis of the female patients personally examined at the Truss Society during the year 1863 fairly represents the average of four years' tables:

	INGUINAL.					FEMORAL.				
	Right	Left	Double.	Total	With Family History.	Right	Left	Double.	Total	With Family History.
Under age of 15 ...	59	44	13	116	44	7	1	—	8	2
Single women.....	38	23	7	68	28	34	30	6	70	20
Married women	8	5	2	15	6	10	5	2	17	4
never pregnant }										
After miscarriage.	—	—	—	—	—	2	—	1	3	1
Mothers	71	98	29	198	65	182	93	38	314	91
	176	170	51	397	143	235	129	47	412	118

correct. This, however, is a matter of very small importance, so long as it be conceded that females are equally liable to either kind. So that, if the reasoning be sound, the argument defeats itself through the inaccuracy of its data. It proves that the size of the fibrous apertures, not only does not predispose to hernia, but does not even determine the variety. It proves, by inference, that there must be some other regulating cause. This will be found in the parietal layer of the peritoneum. When the protrusion takes place through an unclosed diverticulum of Nuck, the species of hernia will be due to an abnormal arrangement of the parietal peritoneum. The same will be conceded for all cases of true congenital hernia, and whenever the tunica vaginalis testis forms the sac. But there is further evidence than this to show that the lining membrane has more to do, than have the fibrous apertures, in fixing the site of a hernial issue. Among females the kind of hernia depends partly upon age and partly upon sexual condition. The tables of the Truss Society show that, although the two kinds are equal in females, femoral hernia is so rare as to be almost unknown before menstruation. Only four cases have, as yet, come under the notice of the writer.¹ Between the ages of fifteen and twenty-five inguinal hernia still continues to be the more frequent form. After this period femoral hernia becomes the rule. Again, femoral hernia is much more common than inguinal among women who have borne children. Among single women the two forms are more nearly equal. But here, also, the age at which the hernia first appears seems to have more influence in determining the variety, than any other condition. It is found² that femoral hernia occurs oftener at an early age in boys than in girls; and yet the femoral opening is not larger in boys than in girls, nor is there any reason to believe that the relative size of the apertures above and below the crural arch becomes altered after puberty. There is, however,

¹ During six years at the City of London Truss Society.

² Taking an average of four years.

fair reason to conjecture that the pelvic peritoneum becomes altered in its nature and condition after this period, and partakes of the changes incident to the tissues and organs involved in the function of procreation. It awaits distension as its natural destiny. A certain measure of relaxation or relaxability may therefore be assumed which would favour protrusion in that region, should other conditions exist. And this is probably the interpretation of the fact that femoral hernia is so much more common (proportionally to inguinal) in females than in males.

A young woman, æt. 23, one of the patients relieved at the City of London Truss Society in the year 1860, presented herself with femoral hernia on the right side. Her statement was that she had been ruptured since the age of four years. She was not conscious that any change had taken place in the position of the hernia since its first appearance. The case was therefore looked upon as an unusual example of infantile femoral hernia in a girl. But the books of the society showed that the hernia was not originally femoral. The patient's name was found entered as far back as the year 1844. This and every subsequent entry was in the handwriting of Mr. J. C. Taunton, the then surgeon to the society. Her age then was seven. The nature of the hernia, inguinal on the right side. The next entry was in 1847, age ten, hernia inguinal on the right side. Again 1852, right inguinal. In the year 1854 her name appears again, age sixteen, hernia still right inguinal. In the following year there is a fresh entry, age seventeen, position of the hernia no longer inguinal, but femoral on the same, *i. e.* the right side. When examined by the writer there was no sign of inguinal hernia, but when the truss was removed a hernia escaped through the femoral ring. This patient's father and brother were also ruptured.

A young woman came at the age of twenty-six, with femoral hernia. She had been ruptured since the age of nine, and was still wearing a truss obtained from the society, and adjusted

by Mr. Taunton, for inguinal hernia of the same side. The femoral hernia appeared first after rising from her first parturition. Her father also had hernia.

In another case a young woman came at the age of nineteen, with inguinal hernia on the right side, which had existed since the age of sixteen. She had two sisters ruptured, both older than herself, who had become mothers before the protrusion appeared. In both the hernia was femoral. The father of the three was also ruptured.

These, and similar cases, add weight to the pathological theory of hernia. Rokitauský's unbiassed testimony corroborates it. When treating of the "anomalies and diseases of serous and synovial membranes," he says,¹ "Continuity of the sac of the peritoneum with the tunica vaginalis may be the result of partial development." And elsewhere he says,² "Arrest of development may occur as defective development of the mesentery in various points." Hence arrest of development (according to Rokitansky³) may result in the concurrence of an abbreviated mesentery with a patent tunica vaginalis. Such a condition will explain the cases before alluded to, in which the tunica vaginalis remains open without protrusion. He elsewhere⁴ speaks of hypertrophy of the peritoneum in the shape of unusual length of the duplicatures, *e. g.* omentum, mesenteries, &c., and of supernumerary folds and pouches, as a congenital anomaly. So that with the aid of Camper and Wrisberg's assertion about the early closure of the left tunica vaginalis, we have a ready explanation of the pathological origin of infantile hernia, and a clue to the interpretation of other forms. For instance, an infantile hernia due to hypertrophy of the peritoneum may be, and indeed generally is, outgrown in a few months by the increase of the capacity of the abdomen. So

¹ Sydenham Soc. transl., vol. viii, p. 17.

² *Ibid.*, vol. ii, p. 12.

³ *Ibid.*, vol. iii, p. 17.

⁴ *Ibid.*, vol. ii, p. 12.

long as the child maintains his health and continues to grow, the hernia will not recur. But it is not at all uncommon for hernia to re-enter the tunica vaginalis about the time of puberty, or soon after, when the patient has reached (or nearly so) his full stature. If it be said, in interpretation of such a case, that the abdominal orifice was closed during growth, but opened again at puberty under the stimulus of sexual maturity, the pathological view is conceded. If, however, it be allowed that the orifice never closed, it must also be granted that the mesentery held the intestines away, and so hindered protrusion.

It cannot be doubted that there are many cases of hernia which, of necessity, owe their existence to a fault in the peritoneum. All congenital cases are of this order, and they constitute no small proportion of the entire list. If, then, it can be shown that all forms and kinds of the lesion, at whatever period of life, and under what conditions soever developed, are equally amenable to the same laws of inheritance, the inference will be reasonable if the conclusion be not inevitable, that all cases spring fundamentally from the same cause, viz., fault in the peritoneum.

Malgaigne¹ ascertained that nearly a third of the patients who came before him had other members of their family ruptured. The tables of the Truss Society show a somewhat larger proportion, slightly more than one third. This estimate is probably below the real proportion. Many of the patients who come to the society know nothing of their relations at all, or have so little intercourse with them as not to have learnt their condition in this particular, such as orphans, foundlings, emigrants, and foreigners. There are some who are ashamed of the malady, and conceal it from their relations, so that it is likely that nearly half the patients have ruptured relatives. But the tendency may be begotten in embryo—as a hybrid peculiarity might—without distinct inheritance. A young mother brought her

¹ 'Leçons Cliniques,' p. 41.

first-born child, a boy, to the Truss Society. She stated, in reply to questions put to her, that no other of her own or her husband's blood-relations than a nephew was ruptured. She and her sister had married two brothers; the first-born of each pair (both boys) were "born ruptured."

The tables of the Truss Society indicate a stronger inherited tendency in infancy and youth than in more advanced life. This may be partly accounted for. In childhood the patients are brought by one of their parents, or by some near relative from whom a history can be obtained. In later life the patients know less of their relatives.

The limits of this paper will not admit, nor does the argument require, the details of the inherited cases. It will suffice to say that, so far as has been made out, the laws of inheritance as laid down by cattle-breeders seem to hold. They say that¹ "peculiarities appearing in the males are transmitted either exclusively or in a much greater degree to males alone;" as also does another rule, viz., "that at whatever period of life a peculiarity first appears, it tends to appear in the offspring at a corresponding age, though sometimes earlier." Fathers, who themselves had hernia in infancy, but have outgrown the affection, beget children with congenital hernia, who also outgrow it. Brothers sometimes become ruptured about the same age, and before their father; and it is not uncommon for children to be brought with hernia in whom no family tendency can at the time be traced; but at the next visit, a year or so later, it will be said in answer to the customary inquiry that the father has become the subject of hernia in the interim.

These, and many more details necessarily omitted, indicate that hernia is hereditary, as much so as any other disease. The disposition not only attaches to families, but to races of men. It is said² to be rare in unmixed, dark-

¹ 'Darwin on Species,' p. 15.

² Knox, quoted by Teale, 'Ab. Hern.,' p. 38; and by Malgaigne, 'Leçons Cliniques,' p. 28.

coloured, savage races, frequent in mulattoes. Lascars¹ are said to be rarely the subject of the malady. So far as the experience of the writer has gone, Irishmen are comparatively rarely ruptured. Very few have come to the society for relief during the past four years. Jews, however, seem to be very prone to the malady. Germans form a numerous class of patients of the society.

Freytag² and Blumenbach state that the Swiss are very liable to hernia. Malgaigne³ and Knox state the Dutch to be strongly predisposed to it. Sir Astley Cooper⁴ says the same of the Maltese.

Blumenbach⁵ considers the gymnastic exercises to which the Swiss and Germans are addicted operate as a cause, while he considers the food of this people predisposes to the malady. They live, he says, almost entirely upon food derived from milk. Old cheese eaten with new cheese, instead of bread, is the mainstay of their living. Blumenbach also suggests that the milk diet of the Dutch is the principal reason of this great disposition to hernia. Soemmering suggests the indigestible nature of potatoes as a likely cause among some; but, as Mr. Lawrence⁶ well says, "it seems strange that a single Irishman should escape the united operation of milk and potatoes. Since, however, ruptures are by no means particularly frequent in Ireland, where nineteen twentieths of the population subsist on these very articles, "either its natives must enjoy some peculiar exemption, or the learned writers quoted above must be mistaken." Nevertheless weakness, from whatever cause arising—whether from poverty and its consequent bad living, or from illness—is acknowledged by almost all writers to be a usual concomitant, if not necessary pre-

¹ Key and Hyslop; see Teale, as above.

² 'Lawrence on Rupt,' 5th ed., p. 41, note.

³ 'Leçons Cliniques,' p. 27.

⁴ 'On Hernia,' 2nd ed., part i, p. 18.

⁵ 'Lawrence on Rupt,' 5th ed., p. 41, note.

⁶ Ibid., p. 48, note.

cursor, of hernia. Sir Astley Cooper¹ lays stress on this. He says that weakness causes relaxation of the rings at the same time that it "operates in elongating the attachments of the viscera." He even considers² that inheritance acts through weakness of the fibrous structure of the rings; a view rightly disparaged by Malgaigne,³ who considers it an influence persistent through life,⁴ though manifested chiefly during the first third.⁵ Nearly all the cases of recent hernia that have come under the notice of the writer have been associated with disturbed health, and often with asthenic bronchitis of a spasmodic sort.

Cases similar to those mentioned by Cooper,⁶ Lawrence,⁷ Richter, and others, in which persons habitually fat have become suddenly lean, and then have become the subjects of hernia, have also come under notice at the society, but very seldom. Fat persons are often ruptured when at their fullest bulk, as often, indeed, as at the time of their collapse. But if this sudden falling away be of itself a cause of hernia, there are few now who would accept Cooper's interpretation of its *modus operandi*. He says,⁸ that "the fat which loaded the spermatic cord, and had extended the apertures to and from the abdomen, being suddenly absorbed, room is left for the viscera to supply its place." Now, as fat does not accumulate under pressure, it cannot, by loading the spermatic cord, dilate the rings. It is, however, stored up abundantly in the mesentery of fat persons, pushing the intestines forwards. This being suddenly absorbed would be likely to leave the intestines hanging lower than natural in the abdominal cavity, and so predispose to hernia. Cases sometimes occur in which all four inguino-crural openings and the umbilicus bulge with hernia at the same time, or in

¹ 'The Anat. and Surg. Treat. of Hernia,' 1804, ch. iv, p. 12.

² Ibid.

³ Op. cit., p. 33.

⁴ Ibid., p. 41.

⁵ Ibid., 42.

⁶ 'The Anat. and Surg. Treatm. of Hernia,' p. 12.

⁷ 'On Rupt.,' 5th ed., p. 46.

⁸ Op. cit., p. 12.

quick succession, as each hernia has been in turn controlled by a truss. In all these cases there has been a concomitance of great prostration, and general laxity of all the tissues.

Such cases are not manageable by mechanical appliances until the constitutional vigour has been in some measure restored. Until this has resulted the protrusion will pass the pads of the instrument, however accurately adjusted, like air-bubbles; but with improved health there comes also a more manageable condition of the hernia, so that men have been able to return to light work with safety.

Hence it is concluded that hernia is a disease, and not an accident; a pathological condition, and not merely a mechanical lesion; that although the proximate cause is mechanical, the remote, predisposing, real cause is pathological. The mechanical theory has been seen to break down, partly through disagreement of its advocates, partly through its failure to satisfy all the conditions of hernia; while the pathological theory, without interfering with the arguments in favour of the mechanical, supplies the complement.

It is frequently inherited, and subject to the rules that generally govern hereditary diseases; and when rapidly produced, its manifestation is generally associated with constitutional disturbance. It is therefore concluded to be itself a disease.

It has been shown, moreover, that the lesion is, in many cases, of necessity due to an abnormal condition of the peritoneum, parietal and mesenteric. Being subject almost equally to the same laws, regardless of age or occupation, it is argued that, in all forms of the malady, the fault is primarily attributable to the peritoneum in its entirety, and that protrusion is due partly to relaxation of the mesentery and partly to laxity of the parietal layer. It is also concluded that some of the conditions of hernia may exist alone without the protrusion of a hernial tumour. The mesentery may be relaxed or elongated alone, and give rise to what

Rokitansky calls "internal hernia,"¹ or may take the form, as in women, of prolapsus; and, lastly, it has been seen that apertures may in both sexes exist for years, perhaps for life, without protrusion, the parietal condition existing without the other.

If this be so it is clear that no operation, whatever its results, can rightly claim to be called a "radical cure," that aims solely at closing the aperture through which a hernia has passed. It is not the object of this paper to disparage the operation. Much value is claimed for it, and it is still on its trial; but inasmuch as its advocates adopt an attractive title, which assumes hernia to be a purely parietal lesion, it has been the writer's object to call in question its accuracy.

To have witnessed twenty-five failures argues of itself nothing against the principle of any operation, nor is it intended to adduce such experience now. If the principle be sound, a more perfected method, or a closer attention to detail, may produce more uniform success; but if the principle be wrong, these failures will, of course, enhance an antagonistic argument.

The object of the operation is to obtain obliteration of the neck of the sac of a hernia by artificially causing adhesion of its walls. If such a result were enough permanently to preclude the recurrence of hernia, a cure might be expected to occur oftener than it does as a consequence of the effects of strangulation. There are several cases on record,² and some must have been witnessed by many surgeons present, as they have by the writer, in which a fæcal fistula, the result by sloughing through the sac of a strangulated hernia, has healed and been followed, after a few months, by a fresh protrusion.

¹ Sydenham Soc. transl., vol. ii, p. 51.

² Dr. Heber Chase's edition of the 'Report of the Philadelphia Med. Soc.,' "On the Radical Cure of Hernia," 1837, p. 169; Jobert, 'Mal. Chir. des Can. Intest.,' tom. ii, p. 69; 'Lawrence on Rupt.,' 5th ed., p. 343; and others.

Suppuration about the sac of a hernia will cause perfect retention for some months. Sloughing of the subcutaneous cellular tissue in the region of the rings will similarly cause temporary retention, as, for instance, after extravasation of urine.

But even when a permanent cure results from the cicatrization of a sloughed sac and fæcal fistula, there has not heretofore been any evidence to show that the cicatrix made the obstacle to protrusion. Dupuytren's experience is otherwise¹:—"We have had," he says, "the opportunity of examining, at the Hôtel Dieu, the bodies of several patients, many years after they had recovered by the mere powers of nature from artificial anus. We have found the intestine not attached to the parietes, as might have been expected, but loose in the cavity. A fibro-cellular cord, extending from the cicatrized portion of the abdominal parietes to the intestine, constituted the last vestige of the adhesions which had formerly united them." Scarpa gives similar evidence²:—"It is a certain fact," he says, "confirmed by a very great number of observations, that after the separation of a gangrene the two sound segments of the intestine retire gradually beyond the ring towards the cavity of the abdomen, notwithstanding the adhesions which they have contracted with the neck of the hernial sac." In these cases adhesions can have had nothing to do with retention of the hernia, because none existed, at least did not continue to exist. There were attachments, but so feeble as to be overcome by some internal traction, antagonistic to gravity in the erect posture, and to the expulsive force of the muscles. It would seem, then, that the sealing together of peritoneal surfaces by inflammation is unable of itself to oppose a sufficient barrier to the recurrence of protrusion, but that whenever a permanent retention follows such a process it must be due to some internal cause.

The only forces that can operate in detaching the intes-

¹ Quoted by Lawrence, *op. cit.*, p. 369.

² Whishart's translation, p. 313.

tine from parietal adhesions are vermicular action, retraction of the mesentery, and the weight of the intestine when the body is horizontal. This last is slight, supplemental, and occasional, although, no doubt, it has an influence.

Retraction of the mesentery is probably the chief agent. Depuytren¹ acknowledges that it is through the medium of the mesentery that the intestine is released, but he seems to consider this membrane as purely a passive instrument, through which the motions of the spine effect the result. But even if it be so, there must still have been considerable retraction and shortening of the mesentery at the spot before it could be made useful in this way. It must first have recovered from the prolongation it suffered synchronously with the original formation of the hernia. Scarpa² rather attributes the recession of the intestine to "puckering of the cellular substance, which unites the neck of the hernial sac to the abdominal parietes within the ring," although he alludes to the possibility of its being "caused by the tonic and retractile action of the intestine itself and of the mesentery." It is likely that both these processes co-operate; but puckering of the parietal peritoneum can never produce the condition spoken of by Dupuytren, namely, the free mobility of the gut within the cavity of the abdomen.

Dissection has shown that the portion of mesentery attaching the protruded gut in the subjects of hernia is generally longer than the rest. This is acknowledged by all writers, but its cause has formed the subject of dispute. Before Scarpa wrote it was looked upon as one of the evidences of hernia, being the result of relaxation of the mesentery.

One old writer³ went so far as to argue that "this relaxation of the mesentery is the effect of an extraordinary con-

¹ Quoted by Lawrence, *op. cit.*, p. 368.

² Whishart's transl., p. 314.

³ Benevoli; Scarpa, Whishart's transl., p. 43.

gestion of fluid, and principally of chyle, which runs through all the vessels of the mesentery, stagnates only in one division of this membranous support of the intestines, and relaxes only that portion of it corresponding with the hernia, while all the rest of the mesentery preserves its natural strength and tension." The extravagance of this view would seem to have driven Scarpa to an extremely opposite opinion, viz., that, by an excess of muscular power over resistance at the rings or weakest part of the walls, the intestine nearest this part is squeezed out, and the mesentery attaching it consequently stretched. The facts and arguments used in this paper point to the mean between these two views as the most nearly true. Relaxation of the whole mesentery will allow the small intestines to descend, and then the compression alluded to by Scarpa will be able to expel the portion least supported by the walls of the belly, and still further stretch the already relaxed mesentery. So long as the original debility continues, this stretching may go on; but returning health will check this process. That part of the membrane which has been supported may regain its wonted condition, while that which has been protruded and left without support will be set or established in its prolongation. When the illness is of short duration, and the protrusion obviated early by mechanical means, the whole of the relaxed peritoneum, mesenteric and parietal, will be likely to regain its pristine state, and result in a cure which will be justly entitled to the term "radical." Such a result is not uncommon in young persons. But even here the term must be limited, for the same predisposition which occasioned the opportunity for one protrusion will be likely, under the influence of constitutional derangement, to repeat that opportunity and give rise to a second.

Prolonged illness or defective mechanism will be followed by confirmed elongation of the mesentery, or its stretched portion, and pouching of the parietal peritoneum. This state of things will render a patient at all times liable to a

return of the hernia, though not necessarily the subject of continual protrusion.

Two patients volunteered the following accounts of their cases:—One, a man *æt.* 64, presented himself for a truss, with inguinal hernia on the right side. His story was that he was first ruptured at the age of nine years on the *left* side. He did not suffer from it, and had never worn a truss. It was always easily returnable. At the age of fifty he was thrown while riding, and pitched upon his head. From this time the hernia disappeared, nor has it ever appeared again on that (the left) side. For twelve years he remained without any hernia; but at the end of that time a protrusion descended through the right inguinal canal, and ultimately filled the scrotum. One of this man's brothers was also ruptured.

The other case was reported by the father when he came to the society for a truss. He said that his son was ruptured when a child, but had been perfectly cured ever since the age of sixteen, when he fell headlong into the water over a ship's side. He had been in the habit of wearing a truss before this accident, but had never needed one since, and several years had elapsed.

These were quite spontaneous statements. Two or three other accounts, very similar and quite as startling, have come under notice.

Many cases have come before the writer, at the Truss Society, in which supposed cures have resulted from the use of a truss on one side. The patients have remained sound for periods, varying from six months to as many or more years, and then the hernia has appeared on the other side.

The same thing has happened after the operation for strangulation,¹ the side operated on remaining sound, but hernia appearing after a year or two on the other side.

The readiest solution that can be offered is that the portion of intestine belonging to the elongated portion of mesen-

¹ 1862. Age 65.

tery had, in these cases, been shifted away from its old home into the region of its new protrusion.

The most "radical cure" is that which takes place in childhood. Here there is no need for a shrinking of the mesentery. The growth of the fleshy and bony boundaries of the cavity outstrips that of the superabundant peritoneum, and adjusts the relation of the chamber to its contents.

*Analysis of the Patients with Inguinal or Femoral Hernia,
during the*

Ages.	Sex.	At the time of Examination.									
		Inguinal.				Femoral.				Inguinal and Femoral.	Gross Total.
		Right.	Left.	Double.	Total.	Right.	Left.	Double.	Total.		
0	Males...	103	46	35	184	—	—	—	—	—	184
	Females	5	—	—	5	—	—	—	—	—	5
1—5	Males...	238	60	51	349	—	—	—	—	—	349
	Females	6	4	3	13	—	—	—	—	—	13
6—10	Males...	91	31	29	151	—	—	—	—	—	151
	Females	8	4	5	17	—	1	—	1	—	18
11—15	Males...	64	36	27	127	1	—	1	2	—	129
	Females	11	3	4	18	—	—	—	—	—	18
16—20	Males...	80	42	42	164	3	—	—	3	—	167
	Females	12	8	1	21	1	4	—	5	—	26
21—25	Males...	101	56	63	220	3	—	1	4	1	225
	Females	13	4	6	23	3	4	5	12	—	35
26—30	Males...	116	69	139	324	4	1	—	5	3	329
	Females	15	17	10	42	18	9	8	35	—	77
31—35	Males...	155	72	162	389	2	4	1	7	5	401
	Females	17	17	8	42	19	14	10	43	—	85
36—40	Males...	123	113	207	443	8	3	5	16	3	462
	Females	14	12	10	36	16	15	9	40	1	77
41—45	Males...	170	122	209	501	4	3	5	12	5	518
	Females	15	13	14	42	36	8	16	60	2	104
46—50	Males...	151	87	254	492	8	7	9	24	5	521
	Females	15	18	13	46	25	15	24	64	2	112
51—55	Males...	124	74	225	423	5	5	8	18	13	454
	Females	6	12	9	27	15	11	15	41	2	70
56—60	Males...	110	62	203	375	8	3	9	20	11	406
	Females	10	10	6	26	19	9	15	43	—	69
61—65	Males...	104	51	191	346	8	2	6	16	14	376
	Females	5	5	7	17	19	9	7	35	1	53
66—70	Males...	72	39	121	232	4	4	7	15	7	254
	Females	8	3	5	16	4	11	8	23	1	40
71—95	Males...	65	31	114	210	3	2	3	8	5	223
	Females	1	4	5	10	8	3	3	14	1	25
TOTALS	Males...	1867	991	2072	4930	61	34	55	150	69	5149
	Females	161	134	106	401	183	113	120	416	10	827

*who were relieved by the City of London Truss Society
year 1863.*

At time of first Discovery.										Family History.					
Inguinal.				Femoral.				Gross Total.		Paternal.	Maternal.	Both.	Collateral.	Descends.	Total.
Right.	Left.	Double.	Total.	Right.	Left.	Double.	Total.								
380	126	82	588	—	—	—	—	588	125	59	5	28	6	223	
12	10	4	26	—	—	—	—	26	9	2	1	—	—	12	
141	32	11	184	—	1	—	1	185	32	28	4	6	1	71	
26	15	7	48	2	—	—	2	50	5	2	1	—	—	8	
67	45	4	116	1	—	—	1	117	22	11	3	7	1	44	
14	7	2	23	1	—	—	1	24	9	3	1	2	—	15	
90	53	9	152	2	—	1	3	155	28	8	2	17	2	57	
12	14	—	26	4	1	1	6	32	11	2	1	1	1	16	
205	129	42	376	5	5	—	10	386	110	19	5	28	2	164	
20	9	1	30	10	9	1	20	50	13	3	1	2	—	19	
222	153	44	423	8	4	1	13	436	107	22	3	36	6	174	
19	19	6	44	20	11	8	39	83	14	7	—	6	—	27	
238	163	76	477	3	6	3	12	489	104	18	2	52	4	180	
22	27	11	60	50	19	9	78	138	20	14	3	9	3	49	
201	163	53	417	8	8	2	18	435	87	15	4	50	6	162	
10	12	5	27	32	18	5	55	82	16	3	1	5	3	28	
200	153	48	401	9	9	1	19	420	77	9	2	40	2	130	
19	17	3	39	37	22	3	62	101	14	8	3	10	3	38	
186	122	44	352	13	3	1	17	369	62	13	2	31	7	115	
6	14	5	25	38	12	6	56	81	13	7	1	6	1	28	
143	99	39	281	12	9	3	24	305	42	7	1	34	5	89	
6	8	4	18	16	13	2	31	49	5	5	—	1	2	13	
93	66	22	181	5	8	1	14	195	38	4	1	15	2	60	
3	5	3	11	10	12	2	24	35	8	1	—	1	—	10	
90	64	25	179	11	4	1	16	195	29	2	—	3	1	35	
3	7	1	11	8	6	2	16	27	2	2	—	2	1	7	
55	29	16	100	—	1	1	2	102	19	2	1	6	1	29	
2	4	—	6	7	5	—	12	18	1	1	—	1	—	3	
26	15	12	53	1	2	1	4	57	7	1	—	6	1	15	
3	—	—	3	—	3	—	3	6	—	—	—	—	—	—	
17	8	5	30	1	—	1	2	32	3	2	—	3	2	10	
—	1	1	2	2	—	—	2	4	—	—	—	—	—	—	
2354	1420	536	4310	79	60	17	156	4466	892	220	35	362	49	1558	
177	169	53	399	237	131	39	407	806	141	60	12	46	14	273	