To Mr. Lyne

An Inaugural Thesis on the Pathology and Analogies of Sinus & Fistula

by William Johnson
Introduction

In choosing this as the subject of my thesis I am fully aware that Fistula & Sinus are themselves, not diseases but symptoms or effects of a producing and maintaining cause, local or constitutional. In discussing the pathology of Fistula I shall consider specially that depending on structure of the urethra, and I shall treat of Sinus in connection with diseased bone as typical of the serous condition.

Fistulous openings are found most frequently in connection with one or other of the excretory channels; and, while the attention of the surgeon is directed mainly to their cause, they are generally regarded by the patient as the source of his present sufferings & the consummation of his past.

Rynsch in describing a case of Carcinoma of the Rectum says truly: "Justicio a certam sustellandum non es edendum, bibendum et quod superfluum est, evacuandum."
Si vero vis, hinc operibus destinato mea sententia, mihi, minue scapiam anteponitur at afflictis."

Perhaps no diseased conditions have been more misunderstood by surgeons than Tuberculosis and Sorens. We find accordingly that, until quite lately, the treatment of them has been characterised as much by want of success as by unnecessary severity; and one cannot help thinking that this condition of parts, so similar whenever it occurs, or by whatever cause produced, would have been better understood if more successfully treated if it had been viewed more exclusively and considered more as an analogous affection, whether met with in the Perineum or the Mammae, the Head and Neck or the Limbs.
† Syme's Principles of Surgery p. 62

† Miller's Principles of Surgery p. 196
Pathology

A sinus is a narrow tract of varying length communicating with any source of irritation and lined by a membrane more or less distinct which secretes a thin copious discharge.

"The term Fistula is usually applied to sinuses connected with the excretory channels".

This distinction gives the word Sinus & the word Fistula a distinct application: but it is by no means adhered to or adopted in most books in their definitions; for a Fistula is generally described as an advanced condition of a Sinus—"a further contraction of the Sinus, with consolidation of its parietes".

But, although the distinction referred to is rarely signified in defining, I think it is generally sufficiently indicated by writers in the practical application of the words when treating of the individual diseases in which
† Miller Principles, p. 233
Sinus and Fistula occur. For instance, no one would call an unnatural opening into the bowel or the Urethra a Sinus today, and a Fistula tomorrow, simply because its channel had become narrower and its lining membrane thicker. So one speaks of a Fistula in communication with diseased bone, however long it may have existed, however much it may have become narrowed, or its pyogenic membrane thickened.

I think the term 'Sinuous Uleer' very well designates that condition of parts which approaches somewhat to the nature of true Sinus without actually constituting it.

In the following pages I shall speak of all narrow communications in immediate or immediate connection with the secretory channels as Fistulas, and of all obstinate patent tracks occurring elsewhere as Sinuses. In treating generally of the two conditions such a restriction is absolutely necessary to prevent confusion; besides, we shall find that they are
† Virchow's Cellular Pathology (Chance's translation)
Lecture III - 1.70
both similar in other respects, while there is this further advantage, that a distinct difference in the treatment of each is indicated.

Both are lined by an adventitious membrane, and this furnishes a thin secretion which is mixed with the natural or morbid products or contents of the cavity, canal, or part with which they communicate— if such communication has been completed. This adventitious lining membrane has no follicles and no distinct epithelial layer; but, otherwise, it is physically and physiologically like a mucous membrane.

Is this new structure an organised exudation: or is it as Virchow says when speaking of Histological Equivalents, an example of one tissue replaced by another analogous one or by "an histological equivalent"? We know that skin and mucous membrane are convertible structures. I have seen two examples of this lately in prolapsed Urethra, where the mucous membrane of
of the vagina had acquired the appearance of skin. We see examples of it often in rhino-plastic operations.

If this be the case, and if we bear in remembrance that there is no distinct line of separation between the cutis vera and the subcutaneous cellular tissue, the former merging into the latter and only differing in being more highly organised — I think it follows that the conversion of the cellular or connective tissue, through which a sinus or fistula lies, into a mucous-like secreting structure is identical with the conversion of true skin into mucous membrane, or at all events only an extension of the same principle. This view will throw some light on the nature and formation of their mucous-like or "pyogenic" lining membrane, as it has been called, if we consider that the irritation which maintains the fistula or sinus places its adventitious lining membrane in the pathological condition of a true mucous membrane in a state of inflammatory catarrh.
Sinuses and Fistulae are always consecutive to other diseased conditions.

Sinuses occur most frequently in the limbs in connection with diseased bones or joints, and most frequently in the mammary gland in connection with abscesses. They occur in the groin in connection with Psoas or Pelvic abscess, disease of the vertebral, and glandular affections. They are also found not unfrequently in the head, neck, or other parts of the trunk, especially in connection with Empyema general or limited.

Fistulae are most common in connection with the anus and the Urethra. They are also found in connection with the urinary bladder, the Lachrymal apparatus, the duct of Sten, the Pancreatic and Biliary apparatus, the Stomach, Colon, etc.

If the communication is complete, the Fistula is termed a "complete" one; if there is only one orifice communicating with the vesice, or channel, or cutaneous surface, it is termed "blind" or "incomplete".
The "Gastro-Colic" is the most common of gastro-intestinal fistulae and may be considered as typical of the purely internal or "Medical" fistula. If I may use the expression. Dr. Abercrombie in his work on Diseases of the Stomach and alimentary organs mentions several cases of this kind of fistula - a condition which Healey was the first accurately to describe. Dr. Murchison mentions the, surgically, interesting fact, that in these cases a stricture of the Pylorus often exists; and he states that, of thirty-one cases, twenty-one were caused by carcinomatous ulceration and ten by the simple perforating ulcer. Perhaps the most notorious fistula which ever existed was a gastro-cutaneous one - viz, that of Dr. Beaumont's patient Alexis St.-Martin.

Dupuytren mentions another which was caused by perforating ulcer of the stomach -

Fistulous openings into the gastro-intestinal canal may be caused, also, by its agglutination to abscesses of the abdominal wall, which subsequently evacuate their contents internally.
† Linton's Elements, p. 135
Dr. Graves of Dublin mentions a case in which there was a gastro-pericardial fistula.

If there is a contracted unnatural aperture into the Trachea or Oesophagus, lined by a secreting membrane which does not tend to heal, this also is called a fistula. A very interesting case of the former condition is detailed by Mr. Leeton in which there was a tightly structured condition above the Tracheal fistula. Cases of the latter condition are referred to by Alex. Munro (Sertus) in his work on "Spasm of the Canals for the food, bile & urine."

It seems wrong, however, to regard every narrow opening leading to an abscess in the neighbourhood of an excretory channel; e.g., in the Perineum or Sacio-rectal space, as an incomplete Urethral or Anal fistula, simply because it is in such neighbourhood. Without reference to its cause and its condition.

Common abscesses may and do occur in these situations just as elsewhere; and
we do not consider every small opening leading to an abscess in other parts as a sinus, if the pyogenic membrane and the increasing induration do not exist. Such abscesses in these situations, if treated by early incision, do not tend to become fistulas, if there is no preexisting cause in the constitution of the patient, in the condition of the neighbouring excretory channel, or the parts immediately concerned. In Dispensary and other practice I have seen and treated several of these cases where, after evacuation, no urethral or focal fistula subsequently formed.

Sine and Fistula vary greatly in their length and still more extraordinarily in their course. They vary, seemingly in an unaccountable manner, from a few inches to twelve inches or more, the longer being, generally, those connected with Boas Abscess.

In February, 1863, there was in Mr. Syme’s wards a patient with two fistulas in connexion with Stricture of the Urethra in the most frequent situation, viz. anterior
† Petits "Oeuvres Poétiques" Tom. IV 1693
to the ball, and one of these fistulae opened in the thigh about seven or eight inches below Plopart's ligament. In the winter of 1862 there was a patient in Mr. Syme's wards with a fistula in the urethra which opened in the abdominal parietes near the umbilicus, its course lying behind the tubis. Petit relates a case where there was a fistula between the rectum and the bladder which allowed the passage of feces and wind through the urethra and was cured by the constant use for a time of the curved catheter.† I have seen several cases where urethral fistulae communicated with the rectum. Cases are on record where vesical fistulae have opened at the umbilicus their track lying through a pervious urethra.

Additional urethral fistulae may succeed to the first one until the whole serotum and perineum are drilled with them; and they also sometimes communicate externally on the flatus or over the ilium. Their tracts lying through the inter-muscular connective tissue of the Glutei and other
† Syme "On Evolutions of the Pelvis"
The Perineum, especially its posterior part, is often scarred with the openings of anal fistulae. But, independently of this condition, it is important to remember that sinuses are very common in this situation in connexion with Morbus Coparinus, Caries, and "exfoliations" which are often "due to strong or continued muscular effort..." so that obstinate sinuses are met with nowhere so frequently as in the region of the Pelvis.†

Mr. Syme has contributed eight cases to the "Pathology & Practice of Surgery," (1848) where sinuses occurred in connexion with exfoliations. That precisely in those parts which I have referred to as the most common situations of the external openings of Urinary & fecal fistulae.

In February, 1863, a patient was treated by Mr. Syme for an exfoliation of the inner surface of the Ischial tendons. A sinus opened about the middle of the gluteal fold, which, on this side, was nearly obliterated. The other indications, however, of Hip-joint disease were wanting.
† Abbeville’s "Surgical & Physiological Essays"
Part 1 - p.52
and Mr. Syme remarked on the occasion, that
sinuses in connection with morbus coxarum
were more frequently on the outer side,
while this one was on the posterior aspect
of the buttock: the exfoliation was felt:
it was cut down upon & removed—
Mr. Abernethy mentions yet another
source of sinuses in this neighbourhood.
"Tuberc abscesses," says he, "occasionally
make their way through the sacro-
ischiatric foramen and assume the
appearance of fistula in ano."†
The bearing of such facts
upon the diagnosis & treatment of
sinus & fistula occurring in this locality
is too obvious to be commented on.

Causes

The causes of E breakout & Fistula are
constitutional & local.

Though due to the former originally
they seem to acquire local characteristics,
such as induration & discharging power,
which are themselves sufficient to act as
maintaining causes. On the other hand, though due originally to a purely local cause, one cannot help thinking that they may produce that weak condition of system, which, of itself seems, under certain circumstances, sufficient to produce them, and which always acts powerfully as a maintaining cause.

The local causes of sepsis & fistula may be further subdivided into those which are in some measure mechanical, and those which are purely vital. Of the first class are foreign bodies, exfoliations, sequestra, and such injuries as punctured contused or lacerated wounds: of the second kind are strictures or other morbid condition of texture, abscesses, ulceration & sloughing.

This division however is too artificial to be of practical value: indeed, a vital cause such as sloughing may give rise to a mechanical cause-the slough: and mechanical causes, such as foreign bodies or exfoliations, by perturbing the vitality of the tissues concerned in the tissues add to themselves vital causes.
Examples of fistula & sinus from most of these causes I have already alluded to. They may give rise either to a fistula or a sinus according to their situation & the previous condition of the parts affected.

Some abscesses, even though freely enough opened, may degenerate into sinuses: they contract, but they do so imperfectly, the action of the lining pyogenic membrane which forms being simply decaying instead of reparative. But if an abscess, as for example a limited empyema, points externally and opens imperfectly, such an opening almost certainly becomes a sinus, and remains so until free evacuation is effected. Of this I saw three examples during the months of January & February—one in Dr Syme's wards, another in Dr Belgic's & a third in dispensary practice.
Mode of Formation of Sinus and Fistula

I think I have already treated sufficiently fully of the mode of formation of sinuses depending upon abscess, ulceration, punctured wounds; in the former deviations of my subject. In all such an open track is first formed which is entirely destitute of the characters of a sinus; but, a cause of irritation, more or less deeply seated, remains or forthwith arises, which causes suppuration at its seat and some degree of morbid nutrition in its neighbourhood. The removal of the aperistaltic product prevents the closure of the channel originally formed and the cellular tissue forming its parietes at length assumes, to some extent, the appearance and properties of a temporary mucous membrane in a state of inflammation, possibly in the manner formerly suggested.

I shall discuss the formation of fistula of the Urethra as perhaps the best type of the surgical fistula. What was said of the causes of sinus...
and fistulae constitutional & local apply here, but in the great majority of cases of urethral fistulae there is structure of that channel and the new communication may be regarded as a provision of nature against complete retention of urine. Indeed Sir A. Cooper considered that the best means of relieving an overdistended bladder when it could not be done by the catheter was by opening the distended part of the urethra behind the stricture thus making an artificial fistula.

"So far as I know" says Sir Charles Bell, "there is no instance of a fistulous opening forming in the urethra anterior to a stricture". This could only apply in the relation of structure & fistula as cause and effect. It could not apply where a two-fold injury caused a stricture at one point and a fistulous opening by loss of texture at a point anterior to the stricture. Nor could it apply where a "master stricture" existed say at a point four or five inches from the orifice behind which there was a fistula while there was a second stricture near the bulb - a condition which I think I have
† Sir A. Cooper on "Abnormal apertures in the Meena"
extends in Cooper & Travers' Surgical Essays, p. 50, Vol. II
Sir A. Cooper thus explains the formation of urethral fistulae. "They are generally the result of stricture."

The urine enlarging the lacunae behind the stricture, and the frequent pressure of the urine upon them and upon the sides of the urethra, leads to an ulcerative process by which the urine becomes applied to a new surface, and when the matter is discharged, be it by nature or by art, the urine passes through the aperture and continues to do so while the stricture remains."

We now know that this sequence of events almost never occurs in the formation of urethral fistulae, and that this condition of "blind internal fistula" very rarely occurs even in fistula in ano. Such a sequence of events could scarcely fail to produce diffuse infiltration of urine but could hardly produce fistula in urethra at least in the first instance. This indeed, is demonstrated to us by the opening of abscesses into the urethra, and sometimes by wounds implicating the urethra, or by
† See "Shonson on the Pathology and Treatment of Structure of the Urethra" (1854) p. 125-129

† Syme on "Structure of the Urethra" - "Pubis in Perineum" 1833 - p. 64.
lacerations, falls, violent shock, incautious use of instruments &c. Such injuries are followed either by infiltration of urine or more remotely by stricture but never by fistula, primarily.

The usual mode of formation of an urethral fistula is as follows:--an abscess forms in the vicinity of the urethra, usually by the irritation produced by some stricture or morbid condition of that channel. It aggravates the stricture but as length is opened it discharges itself generally at the perineum: the patient's symptoms are temporarily relieved, but in a short time urine begins to dribble through the new track, "& continues to do so while the stricture lasts." Mr Syme reports a case which illustrates exactly the usual sequence of events.--I. M. --The swelling of the scrotum & perineum enlarged rapidly. An abscess formed, and a considerable quantity of matter was evacuated by incision; and in a few days the urine began to escape through the opening thus made. +

Undoubtedly, however, the lacunae and natural openings of ducts into the urethra
"The diseases of the Nervous" by Charles Bell (1810)

A - p. 25
are greatly dilated behind the structure, as I have myself observed in recent specimens and preparations. This must have been considered strong evidence in favour of the explanation of fistulae being formed "at intra." Yet we find Sir Charles Bell puzzling himself over the appearance of the urethra where a fistula had formed in the perineum in consequence of a stricture. "I had imagined," says he, "that there would be formed only one rough ulcerated hole; but, if this is the case in the beginning, in one instance at least it must have changed: for I have seen four holes with strong bands interlaced communicating between the canal of the urethra and the cellular substance of the perineum. These holes were crowded in a small space behind the stricture."

"This theory of the formation of fistula was the same as that of Sir A. Cooper which I have quoted: and if it had been correct I think he would have found what he expected, viz., that there would be found "only one rough ulcerated hole." This principle I shall apply in attempting to explain the formation of the..."
Cloacal extremities of sinuses in connexion with necrosed bone.

**Formation of Sinuses of Bone:**

The formation of sinuses in connexion with necrosed bone is a subject of great interest. They communicate with the sequestrum through one or more cloaca in the new or substitute bone, and externally they generally present a perforing orifice, while their track is surrounded by more or less callousity. The usual "pyogenic membrane". The formation of the cloaca used to be explained by the supposed action of the pent up pus on the new bone: now they are known to be due to depressions in the periosteum; and these are supposed to be caused by "alterative absorption from the pressure of confined pus" in process of its gaining the surface. Mr. Goddard says "cloaca are almost invariably opposite a smooth or unaltered portion of the surface of the dead shaft. They result from the pus thrown off from the granulating internal surface of the new shaft making..."
† Goodeir’s “Anatomical & Physiological Observations” p. 12

"its way to the exterior by those parts not yet closed in consequence of having been opposite to portions of the old shaft which had not afforded separated osseous centres."†

I believe that the preponderating weight of evidence is against the view of Mr. Godwin & Professor Virchow that periosteum does not possess an independent power of forming osseous substance.† Into this question, however, I am not called upon to enter. Indeed so far as the formation of the periosteal deficiencies is concerned, both explanations are the same viz that they result from the pus formed within the periosteum "finding its way to the exterior."

So this explanation of the cause & manner of the original periosteal deficiencies which afterwards form the internal or cloacal apertures of sinuses leading to sinusura, I submit the following objections.

In looking at preparations of cortical bone with its cloacal openings, which in some cases severely exist, and in other cases are exceedingly large & numerous, it does seem improbable that all of these openings...
and often cannot bring it into immediate proximity with bone at all. Days or weeks pass by & he again introduces the probe and this time detects a sequestrum either firm or detached.

Now, if the pus by whose agency the sinus or sinuses were formed came directly from the actual seat of disease, viz. the bone, through those apertures in the periosteum referred to, the probe could not fail, if properly directed, to touch the dead bone from the first: indeed it would be the easier the sooner the attempt was made. Yet such cases as I have mentioned are of frequent occurrence and if so what explanation of them can we offer?

I believe that the periosteal deficiencies which subsequently form the cloaca of sinuses are produced much in the same way as fistulae are “completed.” The sinus when first formed is generally, if I may use the expression, “blind” or “incomplete” & hence the probe cannot be made to impinge upon the sequestrum at first: and it is completed, not by the pressure of pus confined within
University museum - several specimens
The periosseum and originating there, but rather by the action of the sympathetic inflammatory process swelling or abscesses in the tissues outside the periosseum as well as in the periosseum itself; although to any or both of these agencies it may succumb the more readily on account of pressure previously exerted by the confined pus "at intra". So that, the sinus is generally formed by the agency of pus which, from the first, was formed outside the periosseum, although due to irritation within; and its cloacal or periosseal extremity, instead of being due to the pressure of pent-up pus, is produced by a combination of causes of which this may be one, but, for reasons given, it cannot be the essential one, and, instead of being the first formed, it is generally the last to be completed.

So that, by accepting the explanation which I have attempted to give of the formation of the cloacal apertures of the periosseum, we can account for their number size being so great in some cases and so much small in others that they are scarcely visible.
2. We can be at no loss to account for the fact that in many cases the sequestrum cannot at first be detected by the probe introduced into the sinus - it being yet "incomplete."

3. We have seen the exact similarity which obtains in many respects between sinuses and fistulas; we have seen that the words may be used to designate the same condition occurring in different situations; the explanation which I have given makes the analogy complete between the formation of the sinus and its completion, the formation of the fistula and its completion, while the usual explanation of the formation of the closer of sinuses of diseased bone would be analogous to Sir A. Cooper's explanation of the formation of fistula, which is now known seldom or never to occur.
Analogies

between

Fistulae depending on Stricture of the Urethra and Sinuses depending on Death of Bone

In their formation

Fistulae may be due to causes local or constitutional, but especially to stricture or diseased condition of the Urethra.

Sinuses may be due to causes local or constitutional, but especially to the intense inflammation which destroys the bone.

In their formation

Fistulae are produced by irritation of inflammatory action in the cellular tissue around the Urethra in the vicinity of the stricture, giving rise to an abscess which generally discharges itself or is discharged externally.

Sinuses, I should think, commence generally by irritation of inflammatory action lighted up in the connective tissue around the bone in the vicinity of its diseased or dead part, giving rise to an abscess which discharges itself or is discharged externally.
III

In their completion

A fistula in the above condition is a "blind external fistula," but sooner or later, often in so short a time as to render the sequence of events doubtful, an opening forms by ulcerative absorption into the lumen, thus rendering the fistula "complete."

A sinus in the above condition may be regarded as a blind external sinus" but sooner or later, an opening forms in the periphery by ulcerative absorption, thus rendering the sinus "complete."

IV

In their appearances

Fistulas are at first single but rarely exist long so the peritoneum being often scarred with such fistulas and their cicatrices; varying also extraordinarily in their course and place of exit, becoming gradually more securely guarded against infiltration of urine by their callosous lining membrane.

Sinuses are at first single but rarely exist long so the neighbouring integument being often scarred with such sinuses and their cicatrices; varying considerably in their course and place of exit, becoming gradually more securely guarded against infiltration of pus and consequent diffuse inflammation by their callosous lining membrane.
In the purposes which theyserve
Fistulas provide against retention of urine and, as it were, attempt to cure the structure by diverting the irritating urine from the diseased part of the urethra.

Sinuses provide a free exit for the pus which may collect underneath the periosteum of the new bone, and as it were attempt to cure the necrosis by providing an exit more or less sufficient for the sequestrum.

In the treatment proper to each
Fistulas require for their cure removal of the structure by dilatation or by external division, after which the fistula will, in the majority of cases, heal without special treatment.

Sinuses require removal of the sequestrum through the spaces already formed, or by an incision commencing with its edge, after which the sinus will heal without special treatment.