To Mr Lyon

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

by

William Jobson

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 Stricture of the Urethra, and I shall treat of Sinus in connexion with diseased bone as typical of the sinuous condition.

Fistulous openings are found most frequently in connexion 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.

Rupsch in describing a case of Carcinoma of the Rectum says truly: "Quotidie a vitam sustentandam nobis edendum, bibendum, et quod superfluum est, evacuandum.

Si vero vita, hisce operibus destinata male sint affecta, mors vitæ saepius anteponitur ab afflictis."

Perhaps no diseased conditions have been more misunderstood by Surgeons than Fistula & Sinus. 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 wherever it occurs, or by whatever cause produced, would have been better understood & 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 Mamma, the Head and Neck or the Limbs

† Syme's Principles of Surgery p. 62

† Miller's Principles of Surgery p-196

Pathology—

Definitions

A Sinus is a narrow track 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 text 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 definition I think it is generally sufficiently indicated by writers in the practical application of the words when treating of the individual diseases in which

† Millers 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. No 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 Ulcer' 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 immediate or immediate connexion with the excretory channels as Fistulæ and of all obstinately 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 — p. 70

both similar in other respects, while there is this further advantage, that a distinct difference in the treatment of each is indicated.

Nature of their lining membrane—

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 organized 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 & Mucous membrane are convertible structures. I have seen two examples of this lately in prolapsed Uteri, 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 Fistulla 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:-their most frequent seat.

Sinus & Fistula are always consecutive to other diseased conditions-....

Sinuses occur most frequently in the limbs in connexion with diseased bones or joints, and most frequently in the Mammary gland in connexion with abscesses. They occur in the groin in connexion with Psoas or Pelvic abscess, disease of the Vertebræ, and glandular affections. They are also found not unfrequently in the Head, Neck, or other parts of the trunk, especially in connexion with Empyema, general or limited.

Fistulæ: where found

Fistulæ are most common in connexion with the Anus and the Urethra. They are also found in connexion with the Urinary bladder, the Lachrymal apparatus, the duct of Stens, the Pancreatic and Biliary apparatus, the Stomach, Colon &c.

Varieties

If the communication is complete the Fistula is termed a "complete" one; if there is only one orifice communicating with the viscus, or channel, or cutaneous surface, it is termed "blind" or "incomplete"

† Murchison "Med: Chirurg: Transactions" London - Vol XLI

Fistulæ in connexion with internal organs.

The "Gastro-Colic" is the most common of Gastric fistula & 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 Haller was the first accurately to describe. Dr. Murchison mentions the, surgically, interesting fact, that in these cases a stricture of the Pilorus often exists; and he states that, of thirty-one cases, twenty-one were caused by carcinomatous ulceration and ten by the simple perforating ulcer. †

Gastro-colic

Gastro-Cutaneous

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.

† Liston's Elements p. 435

Dr. Graves of Dublin mentions a case in which there was a Gastro-pericardial fistula

Tracheal 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. Liston in which there was a tightly stricturned 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."

Oesophageal fistulae

Every narrow track not a fistula or Sinus

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 Ischio-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 fistulous, if there is no precreating 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 facal fistula subsequently formed——

Their length & course

Sinus & 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 longest being, generally, those connected with Psoas Abscess.

Cases illustrating variations in them.

In February, 1863, there was in Mr. Syme's wards a patient with two fistulæ in connexion with stricture of the Urethra in the most frequent situation, viz anterior

† Petit "Oeuvres Posthumes" Tom ij / p 93

to the bulb, and one of these fistulæ opened in the thigh about seven or eight inches below Poupart's ligament. In the winter of 1862 there was a patient in Mr Syme's wards with a fistula in Urethro which opened in the abdominal parietes near the Umbilicus, its course lying behind the Pubis. Petit relates a case where there was a fistula between the rectum & the bladder which allowed the passage of fæces & 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 fistulæ communicated with the Rectum. Cases are on recorded where vesical fistulæ have opened at the Umbilicus their track lying through a pervious Urachus.

Additional urethral fistulæ may succeed to the first one until the whole Scrotum & Perineum are drilled with them: and they also sometimes communicate externally on the Nates or over the Ilium, their track lying through the inter-Muscular Connective tissue of the Glutei and other

† Syme "On Resections of the Pelvis"
(Edin^r Medical & Surgical Journal)

muscles.

Perineal fistulæ

The Perineum, especially its posterior part, is often scarred with the openings of anal fistulæ. But, independently of this condition, it is important to remember that Sinuses are very common in this situation in connexion with Morbus Coxarius, Caries, and "exfoliations" which are often "due to strong or continued muscular exertion ---------- So that obstinate Sinuses are met with nowhere so frequently as in the region of the Pelvis" †

Sinuses in connexion with exfoliations sometimes in same locality.

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 & Fæcal fistulæ.

In February, 1863, a patient was treated by Mr Syme for an exfoliation of the inner surface of the Ischial tuberosity. 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,

† Abernethy's "Surgical & Physiological Essays"
Part 1 – p 52

and Mr Syme remarked on the occasion, that Sinuses in connexion with morbus coxarius 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—

and in connexion with Morbus Coxarius

Mr Abernethy mentions yet another source of sinus in this neighbourhood. "Lumbar abscesses," says he, "occasionally make their way through the Sacro-Ischiatic foramen and assume the appearance of fistula in ano." †

with Lumbar abscess

The bearing of such facts upon the diagnosis & treatment of Sinus & Fistula occurring in this locality is too obvious to be commented on.

— 11 —

Causes

Causes

The causes of ~~Sinus~~ & Fistula are Constitutional & Local.

Though due to the former originally they seem to acquire local characteristics, such as induration & secerning power, which are themselves sufficient to act as

local & constitutional – may superinduce each other –

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 Sinus & 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 morbed 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 perverting the vitality of the tissues concerned in the sinus, add to themselves vital causes.

† Sir C. Bell

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 "secerning 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 Begbie's & a third in dispensary practise

Mode of Formation of Sinus and Fistula

Mode of formation

I think I have already treated sufficiently fully of the mode of formation of sinuses depending upon abscess, ulceration punctured wounds &c in the former divisions 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 remabal of the aplastic product prevents the closure of the channel orgenally 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.

probable explanation

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

† Sir C Bell's "Letters Concerning diseases of the Urethra" 1810

I – p. 25

Fistulæ urethræ;

and fistula constitutional & local applies here; but in the great majority of cases of urethral

Seldom without Stricture:

fistulæ there is stricture 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.

Fistula behind the Stricture

"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 stricture & 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

Exceptions -

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 "Unnatural apertures in the Urethra"
extended in Cooper & Travers Surgical Essays - p. 50 - Vol II

met with.

Sir A. Cooper's theory of its formation.

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" †

ab intra

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

More likely to produce urinary infiltration:

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 "Thomson on the Pathology & Treatment of Stricture of the Urethra" (1854) p. p. 128 & 129

† Syme on "Stricture of the urethra & Fistula in Perineo" 1855 — p. 64

lacerations, falls, violent chordee, incautious use of instruments &c † Such injuries are followed either by infiltration of urine or more remotely by stricture but never by fistula, primarily.

Generally received Explanation

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 at length is opened or 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 — "E. M ——— She 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" †

Case illustrating Sequence of events

Undoubtedly, however, the lacunæ and natural openings of ducts into the urethra

"The diseases of the Urethra" by Charles Bell (1810)

Ley – p. 25

lacunæ dilated behind a Stricture

are greatly dilated behind the stricture, as I have myself observed in recent specimens & preparations. This must have been considered strong evidence in favour of the explanation of fistulæ being formed "ab 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.

Sir C. Bell examines a specimen with four apertures

"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 <u>four</u> holes with strong bands interlaced communicating between the canal of the urethra & the cellular substance of the perineum. These holes were crowded in a small space behind the stricture" †

His 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 cloacæ in the new or substitute bone, and externally they generally present a pouting orifice, while their track is surrounded by more or less callosity & the usual "pyogenic membrane". The formation of the cloacæ 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 deficiencies in the periosteum; and these are supposed to be caused by "ulcerative absorption from the pressure of confined pus" in process of its gaining the surface. Mr. Goodsir says "Cloacæ 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

Their nature:

Their cloacal extremities -

how formed?

† Goodsir's "Anatomical & Physiological Observations" p. 52

† Syme's experiments "On the power of the periosteum to form new bone." Trans. Roy. Soc. Edin. Vol XIV p. 158 :-

"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 Goodsir & 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."

They result from pressure of pus formed by the diseased bone (?)

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

Objections to the received view.

1st

1st from observing specimens of cortical bone.

In looking at preparations of cortical bone with its cloacal openings, which in some cases scarcely exist, and in other cases are exceedingly large & numerous, it does seem improbable that all of these openings

Sometimes very few
Sometimes very numerous
Why (?)

Improbability that so many holes in the periosteum should be formed by pressure of confined (?) pus.

should have been formed by the pressure of confined pus producing that gradual process called ulcerative absorption. Pus does tend to reach the surface, but pus cannot defy that universal law which bids it seek the direction in which there is least resistance: and, if pressure of confined pus was the agent which produced the death of the periosteum at its deficient parts, it might make a few cloacæ but it could not possibly make the multitude of them which we often see, for the pus would either escape at the apertures already formed or it would separate further the periosteum from the subjacent bone as indeed it sometimes does

" —

Objections to the received explanation 2ndly " - from Observation of Cases of necrosis

2nd

Cases like the following are not uncommon.

Sinuses of the integument and all the symptoms of necrosis, with perhaps the previous occurrence of it in the same patient, leave no doubt in the surgeon's mind of the existence of a sequestrum. He introduces a probe through the sinus or sinuses but he fails to make it impinge upon a sequestrum,

Sequence of events detailed

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.

argument deduced from them is that they cannot be accounted for on the received explanation of the formation of periostea deficiencies.

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

Explanation which seems consistent with observed facts:

the periosteum and originating there, but rather by the action of the sympathetic inflammatory swelling or abscess in the tissues outside the periosteum as well as in the periosteum 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 "ab intra". So that, the sinus is generally formed by the agency of pus which, from the first, was formed outside the periosteum, although due to irritation within; and its cloacal or periosteal 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.

first of the Sinuses themselves by abscesses bursting externally:—

then of their subsequently formed internal apertures through hardened textures, inflam.ᵗᵒʳʸ exudations & periosteum: which apertures afterwards become cloacæ

So that,

Resumé

By accepting the explanation which I have attempted to give of the formation of the cloacal apertures of the periosteum, we can account for their number & size being so great in some cases and so few & 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 & fistulæ; 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 cloacæ & sinuses of diseased bone would be analogous to Sir A Cooper's explanation of the formation of fistulæ, 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

I
In their causation

Fistula Urethra 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.

II
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 urethra, 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 perinæum by ulcerative absorption, thus rendering the Sinus "complete"

IV

In their appearances

Fistulæ are at first single but rarely exist long so the perinæum being often scarred with such fistulæ and their cicatrices; varying also extraordinarily in their course and place of exit, & becoming gradually more securely guarded against infiltration of urine by their callous 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 & place of exit, & becoming gradually more securely guarded against infiltration of pus & consequent diffuse inflammation by their callous lining membrane.

V

In the purposes which they serve

Fistulae provide against retention of urine and, as it were, attempt to cure the stricture 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 or the new bone, and as it were attempt to cure the necrosis by providing an exit more or less sufficient for the sequestrum.

VI

In the treatment proper to each

Fistulae require for their cure removal of the stricture by dilatation or by external division, after which the fistula will, in the majority of cases, heal without special treatment.

Sinuses for their cure require removal of the sequestrum through the cloaca already formed, or by an incision commensurate with its size, after which the sinus will heal without special treatment.