ACCOUNT
OF THE
MUSCLES OF THE URETERS;
AND
THEIR EFFECTS

IN THE IRRITABLE STATES OF THE BLADDER,

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Read June 31, 1812.

I AM about to describe a set of muscles which seem not to have been observed by former anatomists. They are attached to the orifices of the ureters, and are seated in the bladder. In health they are the instruments of a very peculiar organic action, and in disease the cause of most distressing complaints.

Before I proceed to describe the anatomy of this part of the bladder, the subject seems to require, that I should give a short historical review of the opinions respecting it.

Of the parts hitherto described as seated at the neck of the bladder — La trigone de la vessie — La Luette — Uvula Vesicæ — Corpora carnosia Morgagni. — Third lobe of the prostate, &c. &c.

In the plates of *De Graaff* there are represented certain folds extending forward from the orifices of the ureters, where they terminate in the cavity of the bladder; and at the lower part of the orifice of the bladder, there is a tubercle faintly indicated. The same appearance is represented by *Bidloo*. In *Santorini* also the natural appearance of these parts is accurately delineated. *Morgagni* expresses himself to this purpose: “at the points where the ureters terminate in the bladder, there arises from each of them a thick round compact fleshy body, which takes a direction towards the orifice of the bladder. These two bodies having proceeded a little way, are united, and proceed forward, terminating in the *Caput Gallinaceum* *.”

Santorini † gives the same description of these parts as *Morgagni* has delivered.

Lieutaud describes these bodies under the term *La trigone de la vessie*. The learned *Portal* is incorrect in saying that *Lieutaud* was the first anatomist who has given their description.

* See *Morgagni Adversaria* i. n. 9. *Adversaria* iii. *Animadver.* xlii.

† In the *Observationes Anatomicæ*, cap. x. sec. xxi.

Portal has thus described the *Trigone*: at the lower part, the internal tunic of the bladder adheres to a triangular body of a cartilaginous hardness, and this body is always prominent in the cavity of the bladder, especially in old men. He proceeds to say, that, at the extremity of the triangle, backwards, the orifices of the ureters open; and at their anterior extremity, there is an eminence slightly protuberant, to which *Lieutaud* has given the name of *Lurette*.

The account leads me again to refer to the plate of the excellent anatomist *Dominico Santorini*. In his second table the *Lurette* and *Trigone* are accurately represented.

He has the following explanation on the letter I.
 “ *Vesicæ urinæ osculum cui prominulum corpus*
 “ *præfigitur quod in affectis vesicæ sic prominet*
 “ *aliquando ut urinæ iter prorsus intercludat.*”
 This refers to the disease with which Mr. Hunter and Mr. Home have made us familiar.

The expression of *Santorini* recalls us again to the remark of *Portal*: he says. “ I have found in
 “ old men who have suffered retention of urine,
 “ the *Trigone de la Vessie* so enlarged, especially
 “ its tubercle, in the form of an *Uvula* (*Lurette*)
 “ that the orifice of the bladder was shut by it *.”

* *Portal*, Cours d'Anatomie Med. T. v. p. 409.

Sabatier follows his contryman in his description of this part of the bladder, but adds; “ the *Tri-gone* and *Luette* are the most sensible parts of the bladder; which is the cause why a stone lodging here produces extreme irritation, while if it lodges in any other part of the cavity of the bladder, it causes little inconvenience :” he adds, “ the uvula (*Luette*,) which terminates the anterior angle is very subject to swell, and then it rises in the form of a round tumor which fills the neck of the bladder, and opposes itself to the flow of urine *.”

Desault, speaking of the tumors which grow in the bladder, has this expression. “ Le sommet de ce viscère n’en est pas plus exempt que son bas-fond; mais ce sont particulièrement ceux qui croissent près de son col, et que quelques auteurs ont pris pour un gonflement de la lutte vesicale, qui occasionnent la retention d’urine.”

This sentence, which betrays the imperfect knowledge which *Desault* had of the disease, is followed by other unequivocal marks of unconfirmed principles and practice: and the whole chapter stands in remarkable contrast with the publication of *Mr. Home*, in this country.

* See also *Lieutaud*, Hist. Anatomic. medica. tumores vesicæ adnati.

In Haller's *Element. Physiolog**, we have a description following that of Morgagni under the title *Colliculi ab Uteribus in Urethram producti*.

These authorities discussed, we come now to the more modern observation of Mr. Hunter.

Mr. Hunter† has described a small portion of the prostate gland which lies behind the very beginning of the urethra; and this he describes as subject to swell out like a point into the cavity of the bladder, where it acts like a valve on the mouth of the urethra. This can be seen even when the swelling is not considerable, by looking upon the mouth of the urethra from the cavity of the bladder.

It is impossible to mistake this; the swelling he describes is the *Uvula Vesicæ* or *Luette* of Lieutaud. The observations of Mr. Hunter, then, go to inform us, that this tumor is of that part of the prostate gland which is below the urethra, and betwixt the lateral portions of the gland.

This discovery carries us back to the great anatomists in whose works we find the elements of all our present knowledge. Morgagni has very fully described the part of the prostate gland which Mr. Hunter mentions, and which he discovered to be the seat of this dangerous malady. Morgagni thus describes it :

* T. v. p. 323.

† P. 170.

“ Quod si vera ulla propago prostatae addenda
 “ est, ea certe est subrotunda et renitens quasi
 “ glandula, quam cum soepe diligentissimus inci-
 “ sor noster in publicis dissectionibus animadvert-
 “ isset inter vesicam, et seminales capsulas qua
 “ sese mutuo hæ jam contingunt, prominentem
 “ et nonnunquam ad angulum conveniendo, effici-
 “ unt, prostantem nos accurato instituto examine
 “ nihil aliud esse comperimus quam corporis ip-
 “ sius prostatae particulam *.”

In addition to the description of Morgagni we have the authority of Sabatier. “ Sometimes,” says he, “ only that part of the prostate is diseased to
 “ which they have given the name of *Luette Vesi-*
 “ *cale*. I have seen several occasions (he con-
 “ tinues) in which the uvula forms a tumor with a
 “ narrow peduncle : this moving with a stream of
 “ urine, closed the opening of bladder †.”

Anatomy of the Neck of the Bladder.

I have now to lay before the Society the anatomy of the neck of the bladder in man.

On dissecting up the inner coat of the bladder, there are seen two strong fleshy columns, which

* Morgagni, *Adversaria Anat.* iv. *Animad.* xv.

† *Med. Operat.* T. ii. p. 72.

descend from the orifices of the ureters towards the orifice of the bladder : they unite and run towards the prostate gland. On the surface, towards the cavity of the bladder, they are denser by the union of the inner coat of the bladder, but they are fibrous, and this fibrous structure is made manifest by dissection from below. They are larger and firmer, but of the same colour and structure with the fleshy columns of the *Detrusor urinæ*. The variety which we find in their length according with the degree of contraction of the bladder, proves their muscularity. Whatever excites the action of the bladder increases the size of these muscles in a remarkable degree, and they always acquire a great increase of power and size when the muscular coat of the bladder becomes more distinct and powerful. In some of my specimens of diseased bladder, I find the cause of this to be stone in the bladder; in others, an ulcer; in many, stricture; but always irritation and the necessity of continual action of the bladder are attended with an enlargement of the muscles of the ureters.

When contracted, the course of these columns is distinguishable all the way from the mouths of the ureters to the beginning of the urethra; and there, at their union, they heave up the inner coat of the bladder producing the appearance of a tubercle at the lower part of the orifice of the bladder.*

* It is this appearance presented by the muscles in a state of contraction, which has led so many of our best authorities to confound it with the disease of the third lobe of the prostate gland.

It is still the form of the inner coat which makes these fleshy columns appear to terminate forward in the caput gallinaceum; which they do not; they only take a firmer insertion. Where these columns unite they are most fleshy, and their fibres are more intricate; then, directing their course towards the lower and backmost part of the prostate, they degenerate into tendon, and are inserted into the portion called the third lobe of the prostate.

Although I have described the course of these muscles as proceeding from the back part forward, because it better corresponds with the first view we have of them, yet, I believe, it is more correct to consider their connection with the prostate gland as the fixed point, and their connection with the extremities of the ureters as their insertion.

USE. — The use of these muscles is, to assist in the contraction of the bladder, and at the same time to close and support the mouths of the ureters. The surface of the bladder where it covers their union on the inside, is endowed with an exquisite sensibility, which is a provision of nature, for their ready and instantaneous action on the stimulus to pass the urine. It is here that is seated that sensibility which produces the natural call to urine, and here also is the seat of diseased irritations.

It will be observed that the orifices of the ureters are not closed by the contraction of the muscular

fibres around them. They are defended against the return of the urine by the obliquity of their passage through the coats of the bladder. It is well known that the extremity of the ureter enters through the coats of the bladder obliquely, and that in consequence of this, there is a valvular action in the coats of the bladder which prevents the regurgitation of the urine into the ducts of the kidney.

But if we look to the adjoining diagram, and consider the subject, we shall find, that in proportion as the bladder contracts, this obliquity must be diminished; and further, if we reflect that the coat which contracts is on the outside of the oblique passage of the ureter, we shall conclude that without some counteracting power on the inside of the bladder to draw down the orifice of the ureter, the obliquity of the passage would be lost. These muscles, which I have now described, guard the orifices of the ureters by preserving the obliquity of the passage, and by pulling down the extremities of the ureters according to the degree of the contraction of the bladder generally.

Explanation of the Diagram.

- Let A. represent the circle of the dilated bladder.
 B. The Ureter or duct of the kidney on entering the coats of the bladder.
 C. The extremity of the duct opening on the inside of the bladder.
 B. C. mark the oblique course of the Ureter through the coats of the bladder.
 Let D. represent the contracted bladder, thickened at the same time by its contractions.
 E. The Ureter passing through the coats.

The lines F. G. drawn from the centre of the circle will intersect corresponding portions of both circles, and demonstrate how the oblique passage of the Ureter through the coats of the dilated bladder becomes more direct in the contracted bladder.

The muscles described act in the direction of the line H, and

The membrane which covers these muscles is the seat of that sense which calls the muscular coat of the bladder into action. Of this we may be sensible in passing the bougie, and still more in passing the urethra sound. As the instrument is passed down the urethra, there is a sickening sensation; as it passes the caput gallinaceum, the nature of the pain is changed; and, lastly, in passing it over the surface of the triangular elevation, produced by these muscles, there is experienced the familiar sensation of the call to pass urine. If it were doubted that here, in a particular manner, is seated that sensibility, which calls the bladder into action, the effect of a stone falling upon the part is sufficient proof. When a patient has a stone in the bladder, there is pain and excitement while it rests in this place, and relief when it lodges elsewhere. The reason why this part is possessed of such sensibility, I apprehend to be, that the muscles of the ureters, may, as it were, be the first alarmed, in order to guard the mouth of the ureters, and preserve their obliquity during the action of the bladder.

its operation is to draw down the orifice of the *Ureter C.* in proportion as the bladder contracts, by which means the obliquity of the passage is preserved.

Action in Disease.

When the sensibility in the seat of these muscles is increased by disease, and the increased sensibility is accompanied with a continual action of the muscles, the prostate gland must suffer unusual excitement. The natural prominence formed by the muscles being directly over the third lobe of the prostate, and their chief attachment being also to this third lobe, we may perceive how it happens that this part is sometimes enlarged without the body of the prostate gland partaking much in the disease. When there is an unusual *nisus* of the bladder, these muscles are the seat of it; and as their united extremities are attached to the lower and middle portion of the prostate gland, they must, I think, promote the growth of this portion in a direction towards the cavity of the bladder. This will produce the true *uvula vesicæ*, the pendulous tumor in the neck of the bladder resembling the uvula of the palate. This tumor hangs into the cavity of the bladder, and falls like a valve upon the orifice of the bladder, proving a most troublesome and dangerous obstruction to the urine.

But whilst I state this as an opinion, drawn from the consideration of the parts in their natural state, I must also submit the naked facts. I have, in my collection, two specimens of the disease of the third lobe of the prostate, where these muscles are remarkably strong. I have, on the

other hand, some specimens of diseased bladder, where the muscles of the ureters are enlarged; and only in one of these is there a beginning enlargement of the middle lobe of the prostate gland.

I have many specimens of bone distorted by the action of the muscles; and many, where, at the attachments of the tendons, the bones are drawn out into spines and tubercles. We may say, such is the effect of the muscles; but though the growth of such spines or tubercles be the effect of the action of the muscles directly, yet these spines will not be formed, unless when the bones are at the same time suffering from disease. So in considering the action of the muscles of the ureters, as influencing the growth of the prostate in a particular direction, I do not imagine that the muscles will do this merely by their mechanical effect. There must be also a disposition to disease in the prostate; and if disease be not present, the irritation of the bladder will continue even till the death of the patient, without affecting the growth of the gland.

On the extremities of the ureters, in the diseased action of the bladder, the contraction of these muscles is converted from a salutary influence, to one which aggravates disease. They still close the mouths of the ureters during the action of the bladder; and the action continuing, they cause an accumulation in the ureters and pel-

vis of the kidney, and influence the kidney itself: thus increasing the extent of the local disorder, and consequently its influence on the constitution.

Such consequences as arise from the irritation and action of these muscles, are to be relieved by removing the cause; by assuaging the sensibility of the surface of the tubercle, and by drawing off the urine. When we know that this spot on the lower part of the orifice of the bladder, is the seat of that irritability which is so distressing, we see that it is practicable to effect it by the use of the bougie. By the introduction of the catheter, the urine is let off without hindrance from the valve: the distressing excitement of the muscles is not perpetuated, and the prostate subsides from its irritation.

This practice, though a direct deduction from the examination I have made, is no more than the advice given to us by the best authors.

Thus we see that a small tubercle was painted by De Graff, and described by others, but the nature and origin of the tubercle was misconceived. Anatomists were calling it *woula vesicæ*, as if that natural prominence was the same with the *tumor* of this part of the bladder. We find that the disease called *woula vesicæ*, is no other than that occasioned by the enlargement of the third lobe of the prostate gland. To Mr. Hunter and

Home, we are indebted for a full knowledge of the nature of this disease. It has been objected to Mr. Home, that he is in vain making that important, which the great anatomists of all ages have failed to discover, or have neglected to notice. I have shewn that the third lobe of the prostate was known to Morgagni, and that it was a subject of discussion in his day. We have sufficient evidence (even on this very subject) of the difference of a fact being noticed in the elaborate works of Morgagni, and of its being familiarly and practically known to surgeons. The third lobe of the prostate was quite forgotten, the consequence was that we were ignorant of the nature of the most fatal disease of the bladder. It would be disingenuously reserving the circumstance, which drew me to attend to this subject,, were I to omit the mention of the late work of Mr. Home, or rather his original paper on the anatomy of the prostate gland. I acknowledge both the merit and the necessity of what he has written: for the observation of Morgagni, and the hint of Sabatier, were forgotten both here and in France, until the subject was distinctly and practically brought forward by Mr. Home. Even the latest French author, Richerand*, still speaks of the enlargement of the anterior angle of the "*trigone vesicale*," and the growth of *fungosities* near the neck of the bladder, obstructing the course of the urine.

* Nosographie Chirurgicale, ii^e. ed. p. 458.

It still remained to be explained, why the small part of the prostate gland, the third lobe of Mr. Home, should be so frequently enlarged, without the affection of the body generally being apparent, or why this part should enlarge more rapidly than the rest of the gland. It was in the prosecution of this enquiry, that I discovered the muscles of the ureters, and after ascertaining their nature, I saw through the obscurities of authors, in treating of the diseases of this part of the bladder ; so that in speaking of the enlargement of the anterior extremity of a natural tubercle, they were deceived, and that, in treating of the *wvula*, they were describing the diseased prostate gland.

EXPLANATION OF THE PLATES.

PLATE IV.

A portion of the inside of the bladder, with the prostate gland appended to it, by the attachment of the common tendon of the muscles of the ureters.

A. The inside of a portion of the bladder.

B.B. The mouths of the ureters opening into the bladder.

C.C. The *muscles of the ureters* ; to shew which more distinctly, the inner coat of the bladder is dissected up, and a bristle is put under them.

D. The union of the two muscles ;—a bristle is put under this part.

E. The tendon of the united muscles of the ureters inserted into the prostate gland.

F. The middle lobe of the prostate gland, into which the muscles of the ureters are inserted : all other connection betwixt the bladder and the prostate gland is cut through, that the gland may hang and stretch out the muscle.

G. The caput gallinaceum, and part of the urethra.

PLATE V.

The lower part and neck of the bladder, the vesiculæ seminales, the prostate gland, the membranous part of the urethra, and (from the lower side) the muscles of the ureters.

A. The spongy body of the urethra cut across.

B. That part of the spongy body called the bulb.

C. Cowper's gland.

D. Membranous part of the urethra.

E. The prostate gland.

F. The extremity of the vasa deferentia, passing through the prostate gland, to open on the caput gallinaceum.

G.G. The vesiculæ seminales.

H.H. The vasa deferentia, where they are near the ureters.

I.I. The ureters, or the ducts of the kidney leading to the bladder.

K. The prostate gland, where it is betwixt the urethra and seminal vessels ; this is the third lobe.

L. The outer coat of muscular fibres cut across.

M. The outer coat of muscular fibres of the bladder ; a portion of these fibres is cut across, to shew the muscles of the ureters.

N.N. The muscles of the ureters seen on the lower surface ; their fibrous structure is more evident on this lower surface.

O. The union of the muscles where their fibres are more intricate.

P. The thin inner coat of the bladder, with some few transverse fibres.

PLATE VI.

This plate represents the diseased prostate gland and part of the bladder. The third lobe of the prostate is enlarged, and the connection of the muscles of the ureters with it is very distinct.

A.A. The lateral portions of the PROSTATE GLAND.

B. The *caput gallinaceum*.

C. The *third lobe of the prostate gland*, considerably enlarged and prominent.

D. The union of the *muscles of the ureters*. Their attachment to the third lobe, C, is very distinct.

E. A piece of bougie passed under the muscles.

F.F. The orifices of the ureters.

This being a fair specimen of disease of the third lobe of the prostate gland in its first stage, I thought I could not have a better opportunity of demonstrating the connection of the muscles of the ureters with the prostate gland, and I therefore dissected up the inner coat of the bladder. This plate at the same time presents a fair specimen of the muscles, when enlarged by continued excitement. I possess several preparations where they appear as strong and distinct as here without dissection.

Drawn by C. Bell

Engraved by J. Stewart