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A
DESCRIPTION
OF ALL THE
BURSÆ MUCOSÆ
OF THE
HUMAN BODY;

THEIR STRUCTURE EXPLAINED,
AND COMPARED WITH THAT OF THE CAPSULAR LIGAMENTS OF THE JOINTS;
AND OF THOSE SACS WHICH LINE THE CAVITIES OF THE THORAX AND ABDOMEN;

WITH REMARKS ON THE
ACCIDENTS AND DISEASES WHICH AFFECT THOSE SEVERAL

AND ON THE
OPERATIONS NECESSARY FOR THEIR CURE,

ILLUSTRATED WITH TABLES.

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TO THE
MEMBERS
OF THE
ROYAL ACADEMY OF SURGERY
AT PARIS;

THIS WORK IS INSCRIBED,
AS A MARK OF THE SENSE
THE AUTHOR ENTERTAINS
OF THE HONOUR THEY HAVE DONE HIM,
BY ELECTING HIM
ONE OF THEIR FELLOWS.

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A
DESCRIPTION
OF ALL THE
BURSÆ MUCOSÆ
OF THE
HUMAN BODY.

SECT. I.

INTRODUCTION.

ALTHOUGH the organs of which chiefly I am about to treat form a very curious part of our structure, the knowledge of which will be frequently found of use in practice; yet the subject has been very unaccountably overlooked even by the latest and most accurate anatomists, and of course is little understood by physicians and surgeons.

It has been long and generally known to anatomists, that the tendons of the muscles, at the wrists and ancles, and in their course along the fingers and toes, are conducted in sheaths; and it did not escape the observation of the accurate Winflow, that these ligamentary sheaths are lined with thin and smooth membranes (*a*). Still later, the very accurate B. S. Albinus discovered shut sacs,

B

where

(*a*) Winflow, Exp. An. Tr. des os frais, 286.

where there were no ligamentary sheaths, interposed between the tendons and bones, to which he gave the name of *Bursæ Mucosæ*: and of these he has described, in his *Historia Musculorum*, sixteen pairs (*b*). Winslow, however, neither sufficiently examined the extent nor structure of the membranes lining the sheaths of the tendons; nor does it appear that Albinus conceived that these membranes have, in all respects, the same structure and uses as those sacs he described under the name of *Bursæ Mucosæ*; which we shall, however, afterwards find is the case.

SOME of the later anatomists have not attended to the discovery of Albinus (*c*): Others, and particularly the very learned Dr Haller, have mistaken the nature of such bursæ; supposing them to be formed of cellular membrane, like to that which covers the belly of a muscle (*d*): While the greater number of the late writers in anatomy (*e*) content themselves with repeating the description of Albinus, without attempting to throw farther light on the subject.

SECT. II.

(*b*) B. S. Albini Hist. Muscul. in 4to, 1734, p. 694.—*Bursæ subjectæ musculis, maxime tendinibus eorum, ad faciliorem mobilitatem.*

In Iliaco interno.

Latissimo dorfi,
Deltoide,
Terete majore,
Bicipite brachii,
Gluteo magno,
Gluteo medio,
Gluteo minore.

In Geminis.

Bicipite cruris,
Semimembranoso,
Crurali,
Gracili,
Gemello,
Soleo,
Tibiali antico.

Of all these a description is given after that of the muscles under the tendons of which they are placed.

(*c*) Cheselden, Lieutaud Eff. An. Leber Præl. An. make no mention of *Bursæ*.

(*d*) Haller, Pr. Lin. Phys. 396, *Cellulosam telam, quæ totum tendinem communis amplectitur, vaginam vocant, musculi tunicæ similem.*—El. Phys. lib. XI. sect. ii. § 39. p. 504. *Ejusmodi cellulosa tela in rotundos magnosque globos congeritur; bursas vocat Albinus, qui varias enumerat. Principuæ sunt in poplite, et flexoribus tibiæ subjiciuntur.*—J. J. Plenck Pr. Lin. Anat. 1775, 132. *Hæc tela circa tendines laxam vaginam format.*—Leber Pr. Anat. 1778. *Textus autem cellulosus tendines ambiens vagina appellatur, p. 36.*

(*e*) Sandifort, Defer. Muscul. Hominis, 1781.—Sabatier, Tr. d'Anat. 1781,

SECT. II.

ORDER *in which the* SUBJECT *is to be treated.*

THE most distinct method of treating this subject will be,

To begin with a few general observations on the number, situation, and connection of the bursæ.

NEXT, To describe the particular situation of all of them, with a reference to tables which represent them of their natural sizes.

AFTER that, To explain accurately the structure of each part which enters into the composition of the bursæ; and to compare their structure, first, with that of the capsular ligaments of the joints; and then, with that of those sacs which line the containing parts of the thorax and abdomen.

IN the last place, To treat of the cause of the dangerous inflammation which generally follows wounds that penetrate into the cavities of the shut sacs, and of the manner of preventing this.

SECT. III.

GENERAL OBSERVATIONS *on the Number, Situation, and Communications of the* BURSÆ.

THESE sacs, so far as I have yet observed, are met with in the extremities of the body only.

THE Reader will therefore find them all delineated in five tables, representing a fore and back view of the arm, the like of the leg, and a view of the sole of the foot.

THEY

THEY are all delineated of their natural sizes, after an incision had been made into each of them, and several of them were kept inflated while the painter drew them. As much of each of the muscles, under which they were situated, is left attached to the bones, as is sufficient to show exactly the places they occupy, and to enable an anatomist to prosecute them by dissection.

I HAVE found about one hundred and forty of them in all; to wit, thirty-three in each of the superior, and thirty-seven in each of the inferior, extremities.

MANY of them are placed entirely on the inner sides of the tendons, between these and the bones (*f*). Many others cover not only the inner but the outer sides of the tendons, or are interposed between the tendons and external parts, as well as between those and the bones (*g*).

SOME are situated between the tendons and the external parts only or chiefly (*h*); some between contiguous tendons (*i*), or between the tendons and the ligaments of the joints (*k*).

A FEW such sacs are interposed where the processes of bones play upon the ligaments (*l*), or where one bone plays upon another (*m*).

WHERE two or more tendons are contiguous, and afterwards separate from each other, we generally find a common bursa divided into branches, with which

(*f*) See Tab. I. D. Q. S. X. Z. l. m. n. o. — Tab. II. N. — Tab. III. M. R. S. V. Y. Z. b. c. k. Tab. V. I. M. S. U. V. f. l. n. t. x. — Tab. VI. N.

(*g*) See Tab. I. l. p. g. r. s. — Tab. II. Q. R. S. T. U. V. W. X. Y. Z. — Tab. III. V. — Tab. VI. F. H. L. R. S. T. U. V.

(*h*) See Tab. I. f. g. h. i. k. — Tab. III. l. m. n.

(*i*) See Tab. II. R. S. — Tab. V. n. o.

(*k*) See Tab. I. o. l. m. z. — Tab. II. S. X. — Tab. III. K.

(*l*) Tab. I. D. K. L.

(*m*) Tab. I. I.

which it communicates; and a few bursæ of contiguous tendons communicate with each other (*n*).

SOME bursæ, even in young and healthy children, communicate with the cavities of the joints (*o*); and in many old persons I have observed such communications formed by use or worn by friction, although there had been no lameness nor complaint of pain made by the person on that account during life (*p*).

THERE is some little difference, in different persons, as to the manner in which contiguous sacs communicate with each other, or with the cavities of the joints: And, particularly, I have observed, that a bursa as large as a hen's egg, which is placed behind the tendon of the extensors of the leg, in some persons has no communication with the cavity of the joint of the knee; but in the greater number of children, as well as adults, although I observed the appearance of a *septum*, or the root of one, yet I found an opening large enough to allow one or two fingers to pass from the bursa into the joint (*q*).

SECT. IV.

An EXPLANATION of TABLES, which represent the Size, Shape, Situation, and Connection, of all the BURSÆ.

AFTER considering these few general observations on the bursæ, the Reader will please to attend more particularly to their size, shape, situation, connections, and communications, by comparing the Tables with the following explanation of them.

C

EXPLA-

(*n*) Tab. II. R. SSS, U. Y.—Tab. V. p. q n.

(*o*) Tab. I. D.—Tab. III. Z. a.—Tab. V. g. h. l.

(*p*) Tab. VII. Fig. 1. 2. 3.

(*q*) Compare Tab. III. Y. Z. a. with Tab. IV. G. H.

EXPLANATION OF THE TABLES

WHICH REPRESENT THE

BURSÆ MUCOSÆ.

EXPLANATION OF TABLE I.

THIS Table represents the Bursæ Mucosæ seen on the Forepart of the Superior Extremity.

- A. The clavicle.
- B. The top of the spine of the scapula or acromion.
- C. The forepart of the scapula.
- D. A bursa under the tendon of the subscapularis muscle, which communicates with the cavity of the joint of the humerus.
- E. The coracoid process of the scapula.
- FF. Two ligaments which tie the clavicle to the coracoid process.
- G. The head of the os humeri.
- H. The body of the humerus.
- I. A bursa mucofa interposed where the clavicle is tied to, and plays on, the coracoid process.
- J. A strong ligament which joins the acromion to the coracoid process.

K. A

TAB. 1.

A. Fyffe del.

K. A large bursa mucosa between the acromion and ligament J. and the capsular ligament of the humerus.

L. A small bursa between the point of the coracoid process and capsular ligament of the humerus. This is sometimes wanting.

M. The tendon of the subscapularis muscle.

N. A small bursa between it and the capsular ligament of the humerus, which frequently communicates with the cavity of that joint.

O. A bursa, which is sometimes wanting, between the origin of the coracobrachialis with the short head of the biceps muscle and the capsular ligament of the humerus.

P. The tendon of the teres major turned outwards.

Q. A bursa mucosa between the tendon of the teres major and the os humeri, and upper part of the tendon of the latissimus dorsi.

R. The tendon of the latissimus dorsi turned outwards.

S. A small bursa mucosa between the tendon of the latissimus dorsi and os humeri.

T. A bursa mucosa within the sheath of the tendon of the biceps flexor cubiti, between that tendon and the humerus.

U. The radius.

V. The ulna.

W. The tendon of the biceps flexor cubiti turned inwards.

X. A bursa mucosa between the tendon of the biceps and tubercle of the radius. The tubercle of the radius is incrusted with cartilage lined with the membrane of the bursa; and within the bursa a *peloton* of fat projects.

Y. The origin of the extensor carpi radialis longior.

Z. A small bursa between a tendon common to the extensor carpi radialis brevis and extensor digitorum communis, and the round head of the radius.

a. The thumb, with the sheath of the tendon of its flexor longus slit open.

b. The sheath of the tendon of the flexors of the fore-finger entire.

c. The thick parts of the sheath of the tendons of the flexors of the middle-finger shown.

d. The sheath of the tendons of the flexors of the ring-finger slit open.

e. The

e. The sheath of the tendons of the little-finger slit open, and the tendons drawn forwards to show them fully.

f. A very large bursa mucosa for the tendon of the flexor pollicis longus.

g. h. i. k. Four short bursæ mucosæ on the fore-part of the tendons of the flexor sublimis of the fingers.

l. A large bursa mucosa behind the tendon of the flexor pollicis longus, between it and the fore-part of the radius and capsular ligament of the wrist and os trapezium.

m. A large bursa behind the tendons of the flexor digitorum profundus, and on the fore-part of the end of the radius and fore-part of the capsular ligament of the wrist. In some subjects these two last described bursæ communicate with each other.

n. An oblong bursa between the tendon of the flexor carpi radialis and os trapezium.

o. A very small bursa between the tendon of the flexor carpi ulnaris and os pisiforme*.

EXPLA-

* This, and likewise the bursa Z, were discovered by my assistant Mr Fyfe.

EXPLANATION OF TABLE II.

THIS Table represents the Bursæ Mucosæ seen on the Back Part of the Superior Extremity.

- A. The dorsum of the scapula.
- B. The cervix of the scapula.
- C. The acromion.
- D. The capsular ligament of the humerus.
- E. The tendon of the infra-spinatus turned outwards.
- G. The tendon of the teres minor turned outwards.
- I. The middle of the os humeri.
- J. The external condyle of the humerus.
- K. The internal condyle of the humerus.
- L. The radius.
- M. The ulna.
- N. The olecranon.
- O. The tendon of the triceps extensor cubiti turned down.
- P. A small bursa between it and the olecranon.
- Q. A bursa between the tendon of the abductor pollicis longus of Albinus and the radius.
- R R. A large bursa common to the two extensores carpi radiales.
- S S. Another bursa common to the extensores carpi radiales.
- T. A third bursa at the insertion of the tendon of the extensor carpi radialis brevis.
- U. An oblong bursa for the tendon of the extensor pollicis longus; and which, at its fore-part, communicates with the bursa S S.
- V. Another bursa for the tendon of the extensor pollicis longus, between it and the metacarpal bone of the thumb.
- W. The tendons of the extensor of the fore, middle, and ring fingers.
- X. A bursa mucofa between these tendons and the ligament of the wrist.
- Y. Another bursa for the extensor of the little-finger.
- Z. A bursa mucofa between the tendon of the extensor carpi ulnaris and ligament of the wrist.

EXPLANATION OF TABLE III.

THIS Table represents the Burfæ Mucofæ which appear in a Fore View of the Inferior Extremity.

- A. The spine of the os ilium.
- B. The inner-side of the os ilium.
- C. The os pubis.
- D. The neck of the thigh-bone.
- F. The root of the great trochanter.
- FF. The thigh-bone.
- G. The iliacus internus muscle.
- H. The pfoas magnus muscle.
- I. The infertion of the iliacus internus and pfoas magnus into the trochanter minor.
- K. A very large burfa mucofa between these two muscles and the capsular ligament of the thigh-bone.
- L. The pectineus muscle.
- M. A burfa between the tendon of the pectineus and thigh-bone.
- N. The adductor brevis of Albinus.
- P. The gluteus minimus.
- Q. The tendinous part of the gluteus medius.
- R. A small burfa mucofa between the gluteus medius and trochanter major. Behind it the tendon of the pyriformis is inferted.
- S. A burfa mucofa between the tendon of the gluteus minimus and trochanter major.
- T. Part of the gluteus maximus which is joined to the gluteus medius.
- U. Part of the vastus externus muscle.
- V. A burfa mucofa between the gluteus maximus and vastus externus.
- W. The patella.
- X. The capsular ligament of the knee.
- Y. The tendon of the extensors of the leg cut and turned up.

Z. A

- Z. A large bursa mucofa behind the tendon of the extensors of the leg.
- a. A communication which the bursa mucofa of this subject had with the cavity of the joint of the knee.
- b b. The ligament which joins the patella to the tibia cut, and its inner side turned outwards.
- c. A bursa mucofa behind it.
- d. A large fatty *peloton* hanging down into the cavity of the bursa.
- e. The tibia.
- f. The fibula.
- g. The back-part of the insertion of the sartorius muscle turned forwards.
- h. The tendon of the gracilis muscle.
- i. The tendon of the femitendinosus muscle.
- k. A large bursa mucofa behind the tendon of the sartorius, and behind the tendons of the gracilis and femitendinosus, covering the inner fore-part of the tibia.
- l. The internal lateral ligament of the knee.
- m. A bursa mucofa between the tendon of the tibialis anticus and under part of the tibia and ligament of the ankle.
- n. A bursa mucofa between the tendon of the extensor pollicis pedis longus and the tibia and capsular ligament of the ankle.
- o. A bursa mucofa for the tendons of the extensor digitorum communis longus, between them and the tibia and ligament of the ankle.

EXPLA-

EXPLANATION OF TABLE IV.

IN this Table a View is given of the Cavity of the Joint of the Knee and of the Bursa above and below it, after making an Incision lengthwise at the Outer Edge of the Patella, and then raising the Patella so that its Posterior Part is directed outwards.

A. The fore-part of the thigh-bone.

B. The trochlea of the thigh-bone in which the patella was lodged.

C. The back-part of the patella turned outwards.

D. The tubercle at the upper fore-part of the tibia.

E. The tendon of the extensores cruris, running into the upper part of the patella.

F. The tendon or ligament from the under-part of the patella to the tubercle of the tibia.

G. A section of a large bursa mucosa, placed between the tendon of the extensores cruris and the fore-part of the thigh-bone.

H. The inner side of the capsular ligament of the knee.

I. The partition which separates the bursa mucosa from the cavity of the joint of the knee, formed by the membrane of the bursa and inner layer of the capsular ligament, joined together by cellular substance.

K. A bursa between the ligament which joins the patella to the tubercle of the tibia and the upper fore-part of the tibia.

L L. A large mass of fat, said, erroneously, by authors, to contain within it synovial glands. The upper part of this mass is covered by the inner layer of the capsular ligament, and the under part of it is lined with the membrane of the bursa mucosa K.

M. The under portion of the fat projects into the cavity of the bursa K.

N. The upper part of this fat projects into the cavity of the joint of the knee.

O. A ligament by which this mass of fat is tied to the thigh-bone between its condyles.

TAB. IV.

Tho. Donaldson delt et Sculpt

EXPLANATION OF TABLE V.

IN this Table the Bursæ Mucosæ, which appear in the Back View of the Inferior Extremity, are represented.

- A. The dorsum of the os ilium.
- B. The os sacrum.
- C. The os coccygis.
- D. The tuber of the os ischium.
- E. The large trochanter.
- F. The middle of the thigh-bone.
- G. The gluteus minimus.
- H. The pyriformis.
- I. A bursa mucosa between the gluteus medius and pyriformis.
- KK. The obturator internus, cut across where its flesh is about to end in tendon.
- LL. The musculi gemelli.
- M. A bursa mucosa between the obturator and os ischium.
- N. A probe put into an oblong bursa mucosa, which is continued to a dotted line between the obturator internus, gemini, and capsular ligament of the thigh-bone.
- O. The quadratus femoris.
- P. The origin of the femimembranosus and long head of the biceps flexor cruris.
- Q. A small bursa mucosa.
- R. The origin of the femitendinosus turned back.
- S. A small bursa mucosa.
- T. The tendon of the gluteus maximus.

U. A large burfa mucofa between the tendon of the gluteus maximus and root of the trochanter major.

V W. Two small burfæ mucosæ between the tendon of the gluteus maximus and thigh-bone.

* The back-part of a large burfa between the tendinous parts of the gluteus maximus and vastus externus.

X. The internal condyle of the thigh-bone.

Y. The external condyle of the thigh-bone.

Z Z. The tibia.

a. The fibula.

b. The biceps flexor cruris turned downwards.

d. The inner head of the gastrocnemius gemellus turned upwards.

e. The femimembranofus muscle turned downwards.

f A burfa mucofa between the tendons of the femimembranofus and gemellus, and the ligament of the knee.

g. A small burfa within the burfa f, from which there is a passage into the cavity of the joint of the knee.

h. A burfa mucofa between the inner-side of the tendon of the femimembranofus and the lateral internal ligament of the knee, from which there is a passage making a communication with the joint of the knee.

i. A small portion of the popliteus muscle.

l. A burfa under it, communicating with the cavity of the joint of the knee.

n. The tendon of the peronæus longus.

o. The tendon of the peronæus brevis.

p. A large burfa mucofa common to the tendons of the peronæi muscles.

q A burfa proper to the tendon of the peronæus brevis.

r. A ligament which ties the fibula to the os calcis.

f. The tendo Achillis turned down.

t. A burfa mucofa between the tendo Achillis and os Calcis.

u. A *peloton* of fat which projects into the cavity of that burfa.

v. The

v. The tendon of the musculus plantaris; one use of which seems to be, to agitate and compress the fatty and glandular organ U.

w w. The flexor pollicis longus and a bursa mucofa between it and the os calcis.

x y. The flexor digitorum longus communis and a bursa mucofa between it and the tibia and os calcis.

z z. The tendon of the tibialis posticus, with a bursa mucofa between it and the tibia and astragalus.

EXPLA-

EXPLANATION OF TABLE VI.

VIEW of the Burfæ Mucosæ in the Sole of the Foot.

- A. The os calcis.
- B. The tendo Achillis.
- C C. The abductor digiti minimi cut across.
- D. The tendon of the peronæus longus.
- E. Another burfa mucosa for that tendon.
- F. An oblong *peloton* of fat within this burfa.
- G H. The end of the flesh and tendon of the flexor pollicis pedis longus.
- I. A burfa mucosa common to t'is tendon and the tendon of the flexor digitorum pedis communis longus profundus.
- K. A fatty *peloton* at the upper end of this burfa.
- M. An imperfect septum between the two last named tendons; in the doubling of which there is some fat included.
- N. The tendon of the tibialis posticus in its burfa.
- O. The place at which the flexor digitorum sublimis is cut off.
- P. The massa carnea Jacobi Sylvii, or flexor tertius.
- Q. The abductor pollicis pedis cut off from the heel-bone.
- R S T U V. Five burfæ mucosæ of the flexor tendons slit open, and which begin a little above the first joint of the toes, and extend to the root of the third phalanx or insertion of the tendons.

TAB. VI.

T. Donaldson del.

G. Cameron sculp.

TAB. VII.

Fig. 1.

TAB. VII.

Fig. 2.

TAB. VII.

Fig. 3.

S E C T. V.

EXPLANATION OF TABLE VII.

IN the three Figures of this Table are delineated Holes worn by use in the Ligaments of Elderly Persons; by which the Cavities of their Joints communicated with those of the Bursæ.

F I G. I.

REPRESENTS a Hole worn in the Capsular Ligament of the Humerus on the Right Side.

A. The clavicle.

B. The top of the spine of the scapula or acromion.

C. The os humeri.

D. Insertion of the infra-spinatus muscle.

E. The insertion of the teres-minor muscle.

F. The insertion of the deltoid muscle.

G. The insertion of the pectoralis major muscle.

H K. A large bursa laid open, which is placed under the acromion, between it and the capsular ligament of the os humeri, represented in Tab. I. at the letter K.

L. The outer side of the capsular ligament of the humerus.

M. A hole, with ragged edges, worn in the capsular ligament of the humerus.

N. A probe passed into the cavity of the joint of the humerus.

O. The point of the probe seen in a sac which communicated with the cavity of the joint, and was covered by the infra-spinatus; but which I have never met with in any other person.

F

FIG. II.

FIG. II.

THIS Figure represents a Hole, such as I have often found in Elderly Persons, worn in the Fore Part of the Ligament of the Thigh-bone, where the Tendons of the Pfoas Magnus and Iliacus Internus Muscles pass over it.

A B. A large bursa cut open, which is interposed between the tendons of the pfoas magnus and iliacus internus muscles, and the capsular ligament of the joint of the thigh, delineated in Tab. III. at the letter K.

C D E. The inner or back part of the conjoined tendons of the pfoas magnus and iliacus internus.

F G. The outer side of the fore-part of the ligament of the joint of the thigh.

H. A hole worn in the capsular ligament of the joint of the thigh, where the conjoined tendons of the pfoas magnus and iliacus internus played most upon it.

FIG. III.

IN this Subject two Burfæ Mucosæ were found behind the Tendon of the Extensores Cruris, both of which communicated with the Cavity of the Joint of the Knece.

A. The back part of the tendon of the extensores cruris, with the two burfæ, dissected away from the thigh-bone.

B. The back part of the patella.

C. The back part of the ligament from the patella to the tibia.

D D. The size of the largest bursa mucofa, described by a dotted line.

E. The size of the small bursa mucofa, described by a dotted line.

F G. Two oval holes in the septum, between these burfæ and the cavity of joint of the knee.

SECT. VI.

S E C T. VI.

GENERAL OBSERVATIONS *on the* STRUCTURE *of the*
BURSÆ.

HAVING considered the shape, size, situation, and connection of the bursæ mucosæ, we shall now more particularly attend to their structure.

THE proper membrane of the bursa is thin and transparent, but very dense and capable of confining air or any other fluid.

It is joined to the neighbouring parts by the common cellular substance. Between the bursa and the hard substance of bone a thin layer of cartilage or of tough membrane is very generally interposed.

To the cellular substance on the outside of the bursa, the adipose substance is connected; except where the bursa covers a tendon, cartilage, or bone much exposed to pressure and friction.

IN several places a mass of fat, covered with the continuation of the membrane of the bursa, projects into its cavity: And, in all such places, the membrane covering the fatty substance has a red colour, from the number of blood-vessels which run on its outer side, or between it and the fat; and from the edges and extremities of the fatty substances fringes project (*r*).

THE inner side of the membrane of the bursa is not only smooth, but, by the copious secretion of a lubricating liquor, is rendered extremely slippery.

S E C T. VII.

(*r*) See Tab. I. X.—Tab. III. d.—Tab. IV. M.—Tab. V. u.—Tab. VI. F.—Tab. VIII. fig. 16, 17.

S E C T. VII.

COMPARISON *of the* STRUCTURE *of the* BURSÆ *with that of the*
CAPSULAR LIGAMENTS *of the* JOINTS.

WE are at first struck with the resemblance which the structure of the bursæ bears to that of the capsular ligaments of the joints; and the more attentively we pursue the comparison, the more just and perfect their agreement will be found.

1. THE internal membrane of the ligaments of the joints, like that of the bursæ, is thin and dense.

2. IT is connected to the external ligaments by the common cellular substance.

3. BETWEEN it and the bones, layers of cartilage or the articular cartilages are interposed.

4. AT the sides of the joint, where it is not subjected to violent pressure and friction, the adipose substance is connected with the cellular membrane.

5. WITHIN the cavities of the joints we observe masses of fat projecting, covered with similar blood-vessels, and with similar fimbriæ or fringes hanging from their edges (*s*).

6. IN the knee we may observe the upper part of such a mass of fat, forming what has been called *the mucilaginous gland of the joint*; and the under part
of

(*s*) Compare in Tab. VIII. fig. 1. 2. &c. to 15. with fig. 16. and 17.

of it projecting into the bursa, behind the ligament which ties the patella to the tibia (*t*).

7. THE liquor which lubricates the bursa has the same colour, consistence, and properties, as that of the joints; and both, as I have found by experiment, are affected in the same manner by heat, mineral acids, and ardent spirits (*u*).

8. IN some places the bursa constantly communicate with the cavities of the joints (*x*); in others they generally do so: From which we may infer a sameness of structure.

9. To render the sameness of the structure of the bursa and capsular ligaments still more evident, I shall next minutely describe the appearance of the several organs which may be supposed to furnish the lubricating liquor, which, in the joints, has been called *synovia*; and I shall be the more particular, because these parts have been generally very erroneously described, especially by late writers, and that no author has yet examined them with sufficient accuracy.

G

I SHALL

(*t*) See Tab. III. d. and Tab. IV. M. N.

(*u*) Immediately after an ox was killed, I opened the joints and large bursa of the legs, and collected the liquors they contained.

These were similar to each other in colour, smell, taste, consistence, and weight; and gave the same degree of slipperiness when rubbed between the thumb and finger.

When mixed with oil of vitriol, diluted with double its weight of water, both liquors became demiopaque, but were not coagulated.

When two parts of these liquors were mixed with three parts of rectified spirit of wine, a portion, weighing nearly one-eighth part of the whole, was coagulated.

When these liquors were brought to a boiling heat, they became less pellucid and more viscid; but the quantity of matter which clotted was very inconsiderable.

When evaporated to dryness, they produced a tough crust, which weighed a small part only of the whole, and burnt in the flame of a candle nearly as a thin slice of horn does.

(*x*) See Tab. I. D.—Tab. III. Z. a.—Tab. V. g. h. l.

I SHALL first describe the structure of the fat, and afterwards that of the mucilaginous, glandular, or fecerning organs.

It has been observed by Dr Havers (*y*), that the marrow consists of globules; and, viewed through a magnifying-glass, looks like a cluster of pearls.

MALPIGHIUS, and after him Morgagni, made the like observation concerning the fat elsewhere in the body: He was, however, doubtful whether the fatty globules were contained in a proper membrane (*z*).

THE globules in the fat have been supposed to be much larger than those of the marrow; and it has been, in the most positive manner, denied by the learned Fr. Grutzmacher, who wrote on this subject in 1748, that the marrow and fat are inclosed with a peculiar membrane (*a*): And, consistent with this, the common opinion, supported by the authority of Winslow (*b*), and by the still later authority of Heister, Haller, Lieutaud, Sabatier, Plenck, Leber, &c. (*c*), is,

(*y*) Cl. Havers, *Ost.* Nov. 1691. p. 167.

(*z*) M. Malpighii, *Oper. Omn.* Londin. 1686. De omento, pinguedine, et adiposis ductibus. An vero singuli adiposi globuli propria rursus investiantur pellicula oculus pertingere nequit.—Morgagni, *Adv. Anat.* 11. p. 16. Tota adiposa membrana ex sacculis constat; sacculi autem pinguisferis globulis, quasi glandulosis acinis, referti sunt.

(*a*) Fr. Grutzmacher, *De Offium Medulla*, Lips. 1748. § XII. In pinguedinis particula microscopio lustrata, corpuscula quidem in exteriori nimirum ejus parte invenimus, convexa et figura quadam irregulari prædita, at longe majora iis quæ in medullæ exteriori interioreve substantia fuere observata.—§ XI. Pinguedo æque ac medulla nulla cingitur peculiari membrana.—Contextus ille cellularis, in quo oleum animale sive pinguedo continetur, sine ulla fere cellularum destructione inflari potest.

(*b*) Winslow, *Tr. des Tegum.* § IV. 69. Les bouchers gonflent la membrane adipeuse, &c.—70. Les interstices cellulaires sont comme autant de petits sacs remplis d'un suc huileux, que l'on appelle graisse.—*Tr. des Os Frais.* 74. La moelle est divisée en une quantité des vésicules ou cellules membraneuses, qui tapissent les cellules osseuses et communiquent toutes ensemble.

(*c*) Heister, *Comp. Anat.* 1732. p. 73. § 20. De pinguedine.—Haller, *El. Phys. T. I.* p. 33. Cellulæ adeo variæ figuræ, adipi sunt pro loculis;—ab uno ad omnes via patet.—Figura utcumque rotunda est,

is, That the fat is lodged in the cells of the common cellular membrane. And as the fat is commonly much wasted in dropfical constitutions, it has been taken for granted, that when the fat was wasted the water occupied its place.

In 1762, the late Dr W. Hunter (*d*), after taking notice of the general opinion that the oil of the adipose membrane is lodged in the same cavities as the water of the anasarca, says, That he had long thought differently; “and that
“ wherever there is fat, he apprehends that there is a glandular apparatus super-
“ added to the reticular membrane, consisting of vesicles or bags for lodging the
“ animal oil, as well as vessels fitted for its secretion.”-----He then specifies his reasons for this opinion; and, in p. 36, proposes the following query: “From
“ all these observations, may we not then reasonably conclude, that the oil of
“ the cellular membrane is lodged in particular vesicles; and not, as the wa-
“ ter of an anasarca, in the reticular interstices of parts?”

His arguments render his opinion extremely probable: but it is plain that he had not examined the structure with the microscope; by which alone it can be ascertained.

LONG before Dr Hunter wrote, and indeed long before he began to study, my father used to observe (*e*), and in his annual courses of lectures to demonstrate, that the marrow, viewed with the microscope, looked like a cluster of pearls. To this I had added the observation, that after a good injection of the vessels, a vascular membrane could be shown surrounding each of the globules; and from which the marrow was beyond doubt secreted. I afterwards found,

on

est, cum ipse adeps sponte se in rotundas glebular colligat.——Lieutaud, Ess. Anat. 1766. p. 105.——
Sabatier, Tr. d' Anat. 1781. T. I. p. 14. La moëlle est composée de vesicules membraneuses qui communiquent toutes ensemble.—P. 15. De membranes que l'on peut distendre en soufflant.—T. 3. p. 355.
On fait que les cellules du tissu adipeux communiquent toutes les unes avec les autres.——Plenck, Pr. Lin. Anat. 1775, p. 176.——Leber, Anat. 1778, p. 110

(*d*) Med. Obs. 1762, Art. II. p. 33.

(*e*) See the first edition of his Osteology, 1726.

on applying the microscope in like manner to the fat, not only of man, but of other animals, that it is every where contained in spherical bags, painted with vessels resembling in size, as well as in structure, those of the marrow; none of which in diameter exceed the six-hundredth part of an inch, nor are less than one eight-hundredth part of it (*f*). Holes in the sides of these bags, or ducts leading from them and connecting them to each other, are not distinguishable, even with a microscope of high powers. In the hope of discovering more fully the texture of the adipose follicles, I have repeatedly examined with the microscope the texture of large steatoms; in which I was a good deal surprised to find the follicles not only as regularly shaped, but nearly as minute as those of the fat in a sound state: Nay, I have often in the same person compared the fat of the sound cellular texture with that of a steatom, without being able to perceive any difference. I have, besides, tried the experiment of holding a thin portion of fat between my finger and thumb, dipped into water heated to above a hundred degrees of Fahrenheit's scale, and pressing it gently, without finding that the adipose follicles can by moderate pressure be emptied or made flat; and globules of oil are not distinguishable, even with the microscope, in the liquors taken from the abdomen, joints, and bursæ.

HENCE some may perhaps infer, that there are no holes or ducts leading from them of considerable size. At the same time, from the oiliness which the surface of the skin, especially in the negro, gets after exercise; from finding that the crusts, procured by evaporating these liquors to dryness, are inflammable; from the greasy feel of the omentum, or of the appendices epiploicæ of the colon even in a living animal; from the shortness of the omentum in man, compared with the great length of it in the quadruped, which we cannot account for in any other way, than that the body of the one animal was intended to be erect, and that of the other horizontal; and, in the last place, as we scarcely can suppose that these fatty bodies in the joints and bursæ and the omenta, serve merely as cushions for the defence of the fecerning vessels, and therefore cannot point out any other material use for the omentum and these

fatty bodies but that of furnishing an oily matter for the purpose of lubricating, I cannot see good grounds for doubting that the oil exudes from its follicles through invisible passages into the cavities of the abdomen, joints, and bursæ.

WE next proceed to examine the nature of the fringes or fimbriæ, which we observe common to the fatty bodies of the joints and bursæ. These have been very generally supposed to be the ducts of glands lodged within and protected by the masses of fat (*g*). Yet, notwithstanding the appearance of accuracy in the description given of these glands, and the probability that these fringes are derived from some such origin, and that such bulky masses of fat as are found in the knee and in the bursa immediately under it, seem, at first sight, to be otherwise useless, I have not been able to discover the smallest vestige of any knotty, granulous, or glandular body lodged within these fatty masses in the joints of man or other animals. Nay, although we observe so many blood-vessels dispersed upon the membranes of these fatty bodies and upon the fimbriæ, and that we cannot doubt that these fimbriæ consist of ducts which contain a lubricating liquor, and that in fact when we press upon them we are sensible that it issues from them; yet their cavities and orifices are so minute,

H that

(*g*) Havers, *Ost.* Nov. 1691. p. 191. Glandulæ mucilaginosæ are red, pappy, &c.—Cowper, *Expl.* of Bidloo, Tab. 79. E. E. Mucilaginous glands of the knee. The ducts of these glands form a fringe, &c.—Morgagni, *Adv.* II. Illud de structura earundem conglomeratarum ex Cowperi anatomia poteris addere, &c.—Winflow, *Exp. An.* 1732. S. 2. 68. Glandes mucilagineuses sont grenues, &c. en forme de grains.—184. Sont entrelardées d'une matiere graisseuse—186. On distingue facilement la substance glanduleuse d'avec l'adipeuse, &c.—J. Weitbrecht, in *Syndesmolog.* calls these masses Adiposoglandulosas.—Chefelden, 1740, p. 48. These glands are seated in fat.—Haller, *El. Phys.* T. II. p. 366. Ex pinguibus globis, quæ in de articulationibus pariter ut glandulæ reperiuntur.—Plenck, *Pr. Lin. Anat.* 1775, p. 97. Glandulæ articulares. Sunt parvæ glandulæ, &c.—p. 309. Glandulæ synoviales, &c.—Leber, *Pr. Anat.* 1778. p. 112. Constat synovia e mucilaginoso liquore glandularum articularium.—Sabatier, *Tr. d'Anat.* 1780. T. I. p. 9. Les glandes synoviales sont logées au milieu de masses graisseuses et rougeâtres, &c.—Leurs canaux excreteurs representent des especes de franges, &c.

that I have not yet been able to get a distinct view of them, though I employed magnifying glaffes (*b*).

THESE fimbriæ seem therefore to be ducts like to those of the urethra, which prepare a mucilaginous liquor without the assistance of any knotty or glandular organ. While by the pressure which the motion of the joints or tendons makes upon their sides, they throw out their liquor in greatest quantity when it is most needed, perhaps the secretion, as well as excretion, of the liquor, is promoted, as in the salivary glands, by motion; and as the extremities of these fringes hang loose into the cavity of the joint, their liquor cannot be pressed back into them by the motion of the joint.

UPON the whole, the synovia seems to be furnished by invisible exhalant arteries, by the ducts of the fimbriæ, and by oil exuding from the adipose follicles by passages not yet discovered. We may suppose these passages to be very minute, not only because they are not to be seen with the microscope, but because the oily matter is so well incorporated with the mucilaginous as not to be distinguishable, even with the microscope, in the form of globules.

As the fat seems to be mixed and incorporated with the mucilage in these sacs, it would perhaps be more proper to name them *vesicæ unguinosæ*, than *burfæ mucofæ*.

10. HAVING fully considered the structure of the burfæ and ligaments in a sound state, we shall next direct our attention to the effects upon them of use, accident, operation, and disease; by which we shall be more fully convinced of the sameness of their structure and properties.

IN old persons, I have frequently found a hole worn in the membrane of a burfa and ligament which were contiguous, particularly at the joint of the thigh-

(*b*) See their structure delineated in Tab. VIII. from fig. 1. to fig. 18.

thigh-bone, by which a communication was opened between the cavity of a bursa and that of the ligament of a joint; yet no complaint of pain or stiffness of the joint had been made by the person during life (*i*). This could not well have happened if the liquor of the bursa had been essentially different from that of the joints.

11. I HAVE repeatedly observed an effusion of fluid into the cavities of the joints and of the bursa from the same causes, or in consequence of the same diseases.

THUS, in rheumatic and gouty constitutions, the joints are often swelled; but when we attend narrowly to the seat of such swellings, we shall generally discover an effusion into the bursa as well as into the cavities of the joints.

IN like manner, in several scrophulous cases, I have observed the bursa, especially at the wrists or ankles, stretched with a viscid fluid.

DROPSY of the joint of the knee, I have remarked, is a more common and a more curable disorder than I believe it is commonly supposed to be. I have kept an account of fifteen patients under this complaint, of whom eleven were completely cured by the use of leeches, blisters, and solution of sal plumbi in vinegar, and purgatives. In two more of the number, an effusion into the joint has continued for several years. In the two remaining, the effusion was complicated with white swelling, and terminated in death.

IN several cases of swelling of the knee with fluctuation, I have found that the fluid was lodged in the bursa behind the tendon of the extensors of the leg; and I have observed, that such tumors are apt, with time, to terminate in an imperfect suppuration, where some purulent matter is mixed with a viscid clear liquor.

WHEN

(i) See Tab. VII. fig. 1. 2. 3.

WHEN the tumor of the knee is small, we readily discover that the fluid is within the cavity of the joint; by observing, that when, after extending the leg in order to relax the tendon and ligament of the knee-pan, we press upon the soft swelling, the knee-pan is lifted up, and the capsular ligament of the knee, under the patella, at the sides of the strong ligament which ties it to the tibia, is protruded.

12. CARTILAGINOUS bodies have been repeatedly observed by surgeons within the cavity of the joint of the knee; and a few such have been taken out after cutting into the cavity of the joint (*k*). Of this complaint I have met with various instances. In some, the cartilaginous substance was fixed in its place; in others, it slipped readily from one place of the cavity of the joint to another. In one case, three or four such moveable substances were distinguishable: in another, there were upwards of twenty such; three of which, in my possession, are delineated in Plate IX. fig. 2. 3. 4. These were so compacted within the joint of the knee, that they impressed each other nearly in the same manner as concretions in the bladders of gall and urine are observed to do.

IN like manner, I have several times observed small cartilaginous bodies form within the bursa of the wrist after violent sprains: and in one case, which I examined with Mr Kilgour surgeon at Ormiston, I found a flat piece of moveable cartilage within the bursa of the glutæus maximus, to which the attention of the patient had been directed by the pain it frequently gave him.

IN another very remarkable case, I found upwards of fifty cartilaginous bodies within the bursa mucosa which is placed behind the tendon of the flexor pollicis

(*k*) See fig. 1. and 2. of Tab. IX. which represent one such, cut out by Mr F. Dewar surgeon in Edinburgh.

pollicis longus (*l*); of which a dozen are represented in Tab. IX. (*m*). The distention of the bursa by these cartilaginous bodies gave such intolerable pain to the patient, that I proposed to Mr Gibson surgeon in Edinburgh, to puncture the bursa, and to press them out at the orifice; which was accordingly done by him.

THE cartilaginous bodies expressed from the bursa, not only resembled those taken from the joints in their consistence, but in their internal structure; both, when cut, seeming to be composed of lamellæ.

THE manner in which such bodies form within the joints has not been satisfactorily explained by authors. Some have supposed that they were portions of the articulating cartilages beaten off by accident from the bones (*n*): But from the appearance of the cartilaginous bodies extracted from the bursa, one half of which had evidently small stalks or peduncles (*o*), and that some force was necessary to make them move to the place punctured, and that in two cases I have seen of cartilaginous bodies within the knee, in one of which an incision was made, these bodies were firmly fixed in their place; I apprehend that all grow from or are nourished by peduncles: and it seems to me not only highly improbable that they can grow when the peduncle is broken by accident, but in one case in which such a cartilaginous body was very moveable, I could not, after two years had elapsed, observe any difference either in its size or mobility.

13. I WOULD, in the last place, observe, that the bursæ and ligaments correspond remarkably in having little sensibility in a sound state of the body, and in acquiring a great degree of sensibility by inflammation (*p*).

I

THAT

(*l*) See Tab. I. 1.

(*m*) See Tab. IX. from fig. 7. to fig. 18.

(*n*) Med. Eff. of Edin. Vol. IV. Art. XIX.—Reimarus de Furgo Articul. p. 32.

(*o*) See Tab. IX. fig. 7. 8. 9. 13.

(*p*) The nerves of the ligaments of most joints are so minute that they cannot be traced by dissection;

THAT ligaments in a sound state have little sensibility, appears in the first place from the inconsiderable pain which often attends the luxation of bones. In which case, however, it may be proved, from a variety of circumstances, that the ligaments are lacerated; but particularly because I found, by various experiments which I made on the human body so long ago as the year 1754, and mentioned since that time in my lectures, that it is impossible, even in children, to dislocate the humerus, which is loosely articulated, without laceration of its capsular ligament, although the joint be previously relaxed by soaking it in tepid water.

THIS fact of the small sensibility of ligaments is still more clearly proved by the experiments of Dr Haller; who, in living animals, not only punctured the ligaments, but after doing so poured oil of vitriol and other caustic substances into the cavities of the joints, without giving such pain to the animals as produced a sensible expression of it. To which we may add, that in a few operations in which, after extracting cartilaginous bodies from the cavity of the joint of the knee, the member was kept at rest and the wound carefully dressed, the wound closed without giving pain (*q*).

ON the other hand, we may not only observe violent pain produced in the joints, by white swelling, gout, and rheumatism, but where wounds have accidentally penetrated into the cavities of the joints, or been made with the intention of evacuating water, or of extracting such cartilaginous bodies, if the wound has not been properly closed, and the joint restrained from motion, a very considerable and painful swelling of the whole joint has ensued; which
in

fection; but in some few places nerves can be traced into ligaments, and particularly at the back part of the wrist, I find in all subjects a nerve adhering to the outer side of the ligament, which I have delineated in Tab. XXVI. of my work on the Structure and Functions of the Nervous System.

(*q*) See Pechlin Obs. Ph. Med.—Dr D. Monro on Dropsy, p. 170.—Two cartilaginous bodies, one of which is in my possession, and delineated in Tab. IX. fig. 1. and 2. were cut at different times, to wit, in 17 and 1778, from the joint of the same knee, by Mr W. Inglis and Mr F. Dewar, surgeons in Edinburgh.

in some cases has terminated fatally, or, to save life, there has been a necessity of having recourse to the amputation of the limb (*r*).

THE bursæ, in the same way, have been unavoidably cut in many of the experiments of Dr Haller and others on the tendons, and have appeared to be insensible. In some diseases, likewise, particularly in scrophula, I have observed them swelled without considerable pain. In other diseases, as in rheumatism, where greater inflammation is excited, we may frequently observe the bursæ at the wrists and ankles swelled with great pain; which is increased by pressing on these parts without bending the joints.

IN the case I have described, where many cartilaginous bodies were found within the bursa of the flexor pollicis longus, when the bursa came to be much stretched, and probably slightly inflamed, the patient felt considerable pain when pressure was made on it; just as in the case of moveable cartilage within the knee, pain is often felt when the cartilage is lodged in certain places of the cavity of the joint. Generally the patient is easiest when the cartilage can be felt at the sides of the joint; but in some cases, as in one I heard mentioned by Mr Middleton in 1756, he is easiest when the cartilage is lodged under the patella and kept from getting out of that situation by a bandage.

AFTER extracting the cartilaginous bodies from the bursa, a very small seton was passed through it; as we took for granted, that if the puncture was allowed to close, the bursa would soon be again distended with fluid. The patient complained little in the time of passing the seton; but three days thereafter we were obliged to withdraw it, on account of a violent inflammation; which, however, had the effect of creating the union of the opposite sides of the bursa, and thereby accomplishing a cure.

IN

(*r*) See Med. Ess. Vol. IV. Art. XX.—Reimarus De Fungo Articul. p. 15, 16.—Dr D. Monro on the Dropsy, p. 170.

IN the course of the present year 1786, I was consulted by two patients with a considerable collection of synovia within the bursa which is behind the insertion of the extensors of the leg into the patella.

IN both, after the application of discharging liquors and of blisters had been tried in vain, the liquor was drawn off by a lancet-shaped trocar passed obliquely, with the view of excluding the air.

IT may be worth while to remark, that the liquor brought to a boiling heat was found to contain much more coagulable matter than the synovia does in a sound state. In one case, the operation was palliative only, and was not followed with inflammation or pain: but in the other case, the whole knee inflamed violently, and suppurated, probably from the restlessness of the patient and admission of the air; so that the amputation of the limb became unavoidable.

IT is therefore evident, that the bursa and capsular ligaments of the joints resemble each other in their sensibility, as well as in their structure otherwise, and in their diseases.

SECT. VIII.

S E C T. VIII.

COMPARISON *of the* STRUCTURE *of the* BURSÆ *with that of the*
PLEURÆ, PERICARDIUM, *and* PERITONÆUM.

WE may perhaps venture a step farther, and remark, that the pericardium, the pleuræ, and the peritonæum, have the adipose substance connected to them; and that the fat in the doublings of these membranes seems to be collected for special purposes; as at the apex of the heart, in the omenta, and appendices pinguedinosæ of the colon: But we do not find, as within the capsular ligaments and bursæ, that fimbriæ or fringes, such as in the joints have been supposed to be the ducts of glands, project from the membranes which cover the fat; and fewer vessels conveying red blood are dispersed in the cellular substance between the fat and these membranes. Hence the liquor secreted into the joints and bursæ probably differs somewhat from that poured into the cavities of the thorax and abdomen.

THERE is, however, a considerable resemblance of structure. And, in farther proof of this, I found in one case of hydrocele of the vaginal coat of the testicle, for which I attended an operation performed by Mr Alexander Wood, four small cartilaginous bodies within the vaginal coat; one of which adhered slightly to the epididymis; the other three seemed to be loose, and floated in the liquor, but perhaps were rubbed off from the inner side of the sac (s) in time of the operation.

K

WOUNDS

(s) See Tab. IX. fig. 19. 20. 21. 22. 23.

WOUNDS of these large parts of the thorax and abdomen likewise generally produce a high degree of inflammation, attended with the most dangerous consequences.

As I apprehend that the danger may be in a great measure prevented by determining the cause of it, I shall treat of this at some length in the following section.

SECT. IX.

S E C T. IX.

Of the CAUSE of the DANGEROUS INFLAMMATION which generally follows the WOUND of a SHUT SAC, and of the MANNER of PREVENTING it.

FROM considering the much greater degree of inflammation, pain, and danger, which attend compound than simple fracture and luxation, and the several facts above stated, with the danger which attends wounds penetrating into the cavities of the head, chest, or belly, it has always appeared to me, that the bad symptoms were much more owing to the admission of the air than to the mere division of the solid or membranous parts. And in this opinion I was much confirmed by a great number of experiments I made on living animals at different times, and particularly in the year 1771; in which, with various views, I laid open the cavities of the thorax and abdomen: For in these I found that the danger was not proportioned to the size of the wound inflicted, but to the time and manner in which the bowels were exposed to the air. I have therefore always inculcated in my lectures, but more especially since that period, the advantages which would attend the exclusion of the air from the deep recesses of the body in performing different operations, and in treating wounds accidentally inflicted.

(A.) In the case, therefore, of cutting into the knee-joint for the purpose of extracting such cartilaginous bodies as have been described, I have always proposed an advice, which I would anxiously recommend, by having heard of and witnessed more than one instance of bad effects when it was not attended to, I mean the drawing up the skin as much as possible before the incision is made, and, as soon as the cartilaginous body is extracted, covering the wound in the ligament, by letting the skin fall down to its natural place, and
by

by proper dressings; at the same time keeping the joint at rest, and pursuing the antiphlogistic course.

(B.) In the operation of the trepan, I have advised that the cranium should not be entirely cut with the saw, but that the operator should desist from sawing when the innermost lamella becomes so thin that it can be easily broken off with a levator or forceps; by which we not only avoid the danger of the instrument pressing rudely on the brain, but also, in many cases, the cutting of the dura mater, and admission of the air to the surface of the brain; which, in experiments I made on half a dozen pigs near thirty years ago, I found increased the danger considerably.

(C.) In the case of air effused into the cavity of the pleura, for which, so far back as 1758, I ventured to propose the paracentesis of the thorax, I have advised that the operation should be performed with a small trocar passed cautiously in a slanting direction; and, after withdrawing the filette, and letting out the effused air, that a flexible canula, with a plug fitted to it, should be introduced, in order to preserve an outlet to the air till the wound of the lungs be closed; and that, before withdrawing the canula, any air remaining in the pleura shall be sucked out with a syringe or elastic bottle. And in 1769 a case occurred, in which, by my direction, that operation was performed nearly in this manner with relief and success (*t*).

Instead of the cautious method above mentioned, Mr Hewson (*u*), and others following him, have proposed an incision by a knife; which I have found, even in experiments on sound animals, generally proves fatal, from the violent degree of inflammation which the free admission of the cold air creates. In one experiment on a pig, the inflammation from the admission of air by a small incision

(*t*) See an account of this case communicated by Mr Kellie, one of the surgeons present, to Dr Duncan, and published by him in his Medical Commentaries, Vol. II. p. 427.

(*u*) Med. Observ. London 1767, p. 396.

incision was so violent as to kill the animal, after producing an adhesion of the lungs with the upper part of the pleura, in the space of thirty-six hours.

(D.) THE danger of the admission of air to the cavity of the pericardium and surface of the heart is proved by the following very singular case, which occurred to me about six years ago. Two men in liquor, disputing about their skill in fencing, the one challenged the other to a match with pokers heated at the points, that there might be no mistake about the hits; and his challenge was accepted. One of them received a thrust under the cartilage of the fourth rib of the right side, about a finger-breadth from the edge of the sternum, in a slanting direction inwards. He complained little till the third day after the accident, when symptoms of deep-seated inflammation began to appear, and, notwithstanding bleeding and other remedies, continued to increase. These, on the tenth day thereafter, when I was called to him, were succeeded by rigor and coldness of the extremities, with a small, frequent, and intermitting, pulse; and two days thereafter he died. On opening his body, a slanting passage was discovered on the outside of the pleura into the mediastinum and cavity of the pericardium; in which last about five ounces of purulent matter were found. The internal part of the pericardium, and the whole surface of the heart, were much inflamed; but there was no mark of injury done to the heart by the point of the poker: and it appeared to me evident, that the fatal symptoms had been chiefly produced by the air entering the pericardium in the time of inspiration.

(E.) The abdominal viscera, I have already observed, are dangerously affected by the air of the atmosphere admitted through wounds. But I have met with three cases in which the air escaped from the alimentary canal into the cavity of the peritoneum, and occasioned a true tympany, attended with such a degree of inflammation, as occasioned, in a few days, slight adhesion of the different parts of the intestines with each other and with the peritoneum, and no doubt contributed much, with other complaints, to the death of the patients. In the first of these cases, to which I was called by the late Dr D.

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Clark and Mr Adie surgeon, about twenty years ago, the arch of the colon had been eroded after a tedious dysentery (*x*). In the second case, two holes were formed in the jejunum by two pins, with their points turned different ways, and tied together with a thread, which had been accidentally swallowed (*y*). In the third case, of a person in a typhus, the colon seemed to have burst during the operation of an emetic.

IN the first of these cases, in which the belly was enormously distended, I prevailed with Mr Adie surgeon to let off the air with a trocar, which relieved the patient much; but as the hole in the colon was large, the abdomen soon filled again with air, and the patient died in a few days thereafter.

(F.) If a large opening has by accident been made into a cavity, or is unavoidable from the nature of an operation, such as the Cæsarean section of the uterus, I used to remark the necessity of excluding, as much as possible, the access of the air during the surgical operation, and afterwards by stitching the wound far more accurately than has been practised by surgeons (*z*).

(G.) THERE likewise seems to me to be strong reason for supposing that the danger, not only in the high but in the lateral operation of lithotomy, may be lessened by the surgeon using every means to exclude the air from the wound and bladder during these operations, and by stitching the teguments after the high operation.

THE late celebrated Mr Smith surgeon in Perth lost, as appears by a copy of his manuscript in my possession, eight of eighteen patients on whom he performed the high operation: and I have observed, that those patients generally died, or were in great danger, where the presence of a number of small stones rendered

(*x*) See Tab. X. fig. 1.

(*y*) See Tab. X. fig. 2. 3. 4. 5.

(*z*) See an extract from my lectures on this subject, published by Dr Alexander Hamilton professor of midwifery, in his Outlines of Midwifery, from p. 345 to p. 352.

dered the operation tedious, from the necessity of introducing the forceps repeatedly.

(H.) WITH similar views I have long ventured to propose a method of operating in hernia, which I am persuaded, from a most successful trial of it in different cases, as well as from reason and analogy, would render this frequent and very necessary operation far less dangerous than it has hitherto proved in the hands of the most experienced and dexterous surgeons. And as this is a subject of the utmost importance, I shall state it more fully than is perhaps necessary for illustrating the chief subject of this work.

THAT I may give a fair representation of the opinion and practice of the present most eminent surgeons, I shall quote the following passages from the works of one of the latest and most justly celebrated authors in surgery, I mean Mr Pott (*a*).

IN the first place, he tells us (p. 286), “ These are my principal reasons for
“ believing that the mere stricture made by the tendon is, in the generality
“ of incarcerated ruptures, not only a sufficient, but the primary and indeed
“ the sole cause of the symptoms, and of all the mischief.”

WHEN, after bleeding, glysters, &c. pressure, posture, and agitation of the patient's body, are found to be insufficient for the reduction of the bowels, recourse is had to the operation; which is directed to be done in the following manner: “ An incision must be made through the skin and membrana adiposa, beginning just above the place where the intestine passes out from the
“ belly, and continuing it quite down to the lower part of the scrotum---The
“ place to make the incision in the hernial sac is about an inch and a half below the stricture, and the opening need not be larger than to admit the end
“ of the operator's finger---With the knife on the finger the sac must be divided quite up to the opening in the tendon, and down to the bottom of
“ the

(*a*) Pott's works in 4to, 1775.

“ the scrotum---The sac being laid open, the intestine generally pushes out
 “ immediately---This is the time to try whether, by gently drawing out a
 “ little more of the gut, its bulk cannot be so reduced as to enable the sur-
 “ geon to return it back into the belly without dividing the tendon---Yet if
 “ it (the reduction) cannot be very easily accomplished without the division
 “ of the tendon, it had better not be attempted---The sac and stricture being
 “ divided, the contained parts come into view---In returning the intestine,
 “ care should be taken to put in that part first which came out last, &c. A
 “ considerable part of the hernial sac, if large, thick, and hard, may very
 “ safely and properly be removed---An old rupture which was originally con-
 “ genital is subject to a stricture made by the sac itself, independent of the
 “ abdominal tendon, as well as to that made by the said tendon. And in this
 “ kind of hernia I have more frequently found adhesions of the parts with
 “ each other, of the intestine with the testicle (*b*).” Stitching up the wound
 is not directed to be done by Mr Pott; and some late writers tell us it ought
 never to be attempted.

AFTER observing the steps directed to be taken in the operation, let us con-
 sider the degree of danger which attends the operation, and the chief cause
 or causes of that danger; by which we shall be led to the way of avoiding
 them.

It is not only true that a great proportion, in general, of those on whom
 the operation for hernia has been performed, dies; but it must be acknow-
 ledged, that many die on whom the operation has been done early, before
 symptoms of violent inflammation bordering on mortification have appear-
 ed. Nay, Mr Sharp tells us, “ That he has seen two or three patients,
 “ who were in every respect hale and strong, and who submitted to the ope-
 “ ration merely to get rid of an inconvenience, die a few days after the
 “ operation;” and adds, “ that the event, though very surprising, should be a
 “ lesson never to recommend this method of treating an epiplocele, unless
 “ it

(*b*) See Mr Pott's works in 4to, 1775, pages 286, 278, 279, 280, 289, 290, 312.

“ it is attended with inflammation,” &c. (c). The same thing has occurred to other eminent surgeons (d). To which the reader will please to add what was before observed, that if wounds be made into the abdomen of sound animals, and that a portion of the alimentary canal, as large as that which is often contained in a herniary sac, be handled and exposed to the air, the animals frequently die.

THAT the wound of the tendon or peritonæum contributes little or nothing to the fatal event, appears clearly from the following circumstances.

IN the first place, I might with great propriety quote the numerous experiments of Dr Haller and others, who have found that tendons may be wounded without pain or material bad consequences. But without dwelling on these experiments, I have in several cases directed the aponeurosis of the human temporal muscle to be cut largely in fractures of the cranium; I have directed an incision to be made in the aponeurosis of the biceps flexor cubiti, for the discharge of fetid matter confined by it; I have seen it repeatedly divided in the operation for aneurism; I have in many living animals cut the linea alba and the peritonæum freely; I have in two cases of bubonocèle cut freely the tendon of the ring of the external oblique; and in two cases of crural hernia, divided with like freedom the tendon of the external oblique, called Ligament of Fallopius. In two of these cases, the peritonæum, which was thickened, and formed a stricture at the neck of the sac, was divided; yet all these incisions were performed without producing any dangerous consequences. In like manner, I have seen the vaginal coat of the testicle laid open by incision; but the dressings having slipped from between the lips of the incision, these grew together without producing such a degree of inflammation as seemed necessary to effectuate a cure, so that there was a necessity of tearing them asunder to introduce dressings and to admit the air.

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(c) See Sharp Op. of Surg. 1761, p. 28.

(d) J. L. Petit Tr. des Mal. Chir. 1774, T. 2. p. 354. &c.

WE may therefore conclude, without a doubt, that the danger of the operation of hernia is not owing to the mere division of the tendon or of the peritonæum ; but that it depends chiefly, and almost solely, on the handling of the bowels, and the exposure of these and of the inner side of the sac to the air: Nay, in some cases where the operation of the hernia had proved fatal, I observed, on opening the abdomen, that portions of the intestine, and likewise of the peritonæum, at a distance from the herniary sac, were much inflamed, although the patient had not before the operation complained of pain, except at the place of the rupture.

WHEN we now review the opinion and the practice of surgeons, we shall perhaps find they are not a little inconsistent with each other: for “ if the
“ mere stricture made by the tendon is, in the generality of incarcerated rup-
“ tures, not only a sufficient, but the primary and indeed the sole cause of the
“ symptoms, and of all the mischief,” why, after the skin is divided, do surgeons first lay open the herniary sac its whole length, and then cut the tendon; instead of merely cutting the stricture made by the tendon, without opening the sac, and then reducing the bowels by pressure, posture, and agitation, if the latter should ever be necessary?

THEY pretend indeed to assign as reasons for their practice, that unless the sac is laid open, we cannot know in what state the bowels are; that the intestines or omentum are liable to mortification; that collections of fetid water are apt to occur, which, on being pushed back into the abdomen, might be productive of mischief; that sometimes the cause of strangulation has been detected either in the entrance to the sac or among the bowels protruded; or they tell us there are adhesions of the bowels to the inner side of the sac, which ought to be separated.

BUT such kind of reasoning, if it has weight, goes farther than is intended; for it ought to prevent surgeons from attempting in any case, at least from attempting in most cases, the reduction of a hernia.

YET

YET nothing is more common than to see surgeons doing every thing in their power to reduce a hernia; and in a few minutes or hours thereafter, instead of taking off the stricture by cutting the tendon, laying open the herniary sac, as if the reduction of the bowels would otherwise have been unsafe. Surely no reason can be given why the reduction of the bowels should be safe before the tendon is cut, but unsafe after it is cut.

BUT instead of using this kind of *argumentum ad hominem*, as it is called, I would observe farther, that it so very seldom happens that one part of the intestine is twisted around another, or the omentum around the intestine, so as to strangulate it, that we find only a very few such cases mentioned in the whole history of surgery. And if even we were to suppose such a case of twisting or volvulus, if the hernia had not continued so long as to produce an accretion of the bowels, the effect of the twisting and pressure would probably be taken off by pushing the bowels back into their natural place in the large cavity of the abdomen. As for the fetid water, which it is said is apt to occur, and that the pushing it back into the abdomen might be productive of mischief; from what I have observed in the operation of hernia, I am very doubtful whether fetid water is ever produced except where there is mortification. Water is indeed often effused in a strangulated hernia; but if there is no mortification, and the hernia be reduced, that water produces no bad symptom, but is soon absorbed. If this was not the case, the reduction of every hernia which had been for a short time strangulated would be attended with danger.

WE are by this observation led to consider the treatment in mortification.

IF it be certain that the bowels are mortified, the necessity of opening the sac is evident, that we may give our patient a chance of life, though to be attended with most uncomfortable circumstances: But if there be the smallest chance that the inflammation may terminate without mortification, it is equal-

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ly certain that nothing can be so pernicious as opening the sac, and that the bowels ought to be returned without exposing them to the air.

To make this more evident, I shall suppose that the bowels cannot be reduced by taxis, or that the operation is necessary in two hundred patients; and that in one fourth part of the number the bowels are so much strangulated and inflamed that the termination in a mortification could not by any means be prevented, but that in the other three fourths there is a probable chance that the inflammation may be dispersed.

If the operation be done in all these cases by opening the sac, it is probable that of the first fifty we may save one or two in all; and of the other hundred and fifty, thirty or forty at the utmost. Whereas, if we suppose that in all these patients the skin and tendon only are divided, and the bowels reduced without opening the sac, we should indeed lose all those in whom the mortification was complete: but I am well convinced we should not lose above ten or twenty at most of the other hundred and fifty; and that, upon the whole, many more lives would be saved.

AFTER having reasoned in this manner upon the subject for several years, I determined to put this method of operating to the trial, and have accordingly directed it to be practised in four cases; in all of which the patient seemed to be in great danger, and yet every one of them recovered without a single bad symptom in consequence of the operation.

IN 1770 I was called, along with Mr Alexander Wood, to a case of crural hernia in a woman thirty-five years of age, with symptoms of strangulation which had continued three days. Finding it impossible to reduce it, I prevailed with Mr Wood to cut the tendon without opening the sac, and then to attempt the reduction; which we executed with the utmost ease.

IN 1774, in a case of hernia congenita, to which I was called by Mr Clark-son surgeon at Dalkeith, we found the neck of the sac as well as the tendon of the oblique muscle extremely constricted. After cutting the skin and tendon, we with much difficulty divided the stricture at the neck of the sac; and, having reduced the bowels, we stitched the teguments.

IN the end of 1781, I was called by Mr Arrot surgeon in Edinburgh to a gentleman considerably above sixty years of age, who had been long subject to a large hernia, which had been strangulated for several days. All the common means of cure having proved ineffectual, I proposed the incision of the tendon, which was very easily executed; and after that all the bowels were readily returned into the abdomen, except a portion which seemed to grow firmly to the inner side of the sac. All the bad symptoms disappeared; and the incision, the sides of which were supported by stitches, closed like a common wound of the teguments.

IN 1782, I was called by Mr Simson and Mr Calderwood surgeons in Dalkeith to a case of crural hernia, which had been strangulated more than two days, in a woman thirty-five years of age. I directed the tendon to be cut; but still finding resistance from a straitness and thickening of the neck of the sac, we made a small perforation in the peritonæum above the stricture, and introducing a probe bent semicircularly at its point cut the neck of the sac upon it. We then easily reduced a small portion of the ilium which was strangulated, and stitched the wound accurately. Six days thereafter I received from Mr Calderwood the following letter:

“ S I R,

“ I HAVE the pleasure to inform you that our patient at Dalhousie pro-
“ mises a favourable recovery. She has had regular and free passage twice
“ a-day. The pain in her belly is quite gone. She has had hardly any de-
“ gree of fever; and the wound discharges good matter. I am convinced

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“ the

“ the stitching, beside lessening the danger, will contribute very much to a
 “ speedy recovery.

I am, &c.

DALKEITH, Nov. 8. 1782.

R. CALDERWOOD.”

THIS patient, and, so far as I know, all the others, are still alive and well.

WE are told, in the last place, that the sac ought to be laid open, in order that the surgeon may separate any adhesions the bowels may have contracted.

FOR my own part, I am much inclined to believe, that, in the case of adhesion, the safest and best general rule will be, to take off the stricture by cutting the tendon, without exposing the patient to the imminent danger of opening the sac, to be heightened by the time which must be necessary for the separation of the adhesions.

BUT if, instead of this, the reader shall, upon the authority of Mr Pott, judge it advisable in all cases to attempt the separation of adhering parts (*e*), it will surely be time enough to open the sac after we have taken off the stricture by cutting the tendon, and found that the bowels cannot be reduced by pressure because they adhere to the inner side of the sac.

THE rule of opening the sac after dividing the skin, seems to have been introduced because surgeons supposed the mere incision of the tendinous parts constituted a principal part of the danger of the operation; and that they were by no means aware that the danger proceeded chiefly and almost entirely from the exposure of the bowels to the air: And this practice has

(*e*) Mr Pott, p. 291. says, “ I have seen the intestines very firmly adherent to each other, to the sac, to the omentum, and to the testicle; but never in such a state of adhesion as to be incapable of being returned.”

has of late been transmitted from one author to another, from a want of due attention and reflection (*f*).

UPON the whole, I have no doubt that many lives may be saved by adopting the following rules in the operation for hernia.

IF the surgeon is not called till the bowels are evidently in a state of mortification, the method recommended by authors is to be followed.

BUT if he is called in proper time, after trying in vain the ordinary method of reducing the bowels, he ought to operate more early than is commonly done, or before the inflammation can have produced adhesion; in which case the operation, after dividing the skin, should consist merely in the taking off the stricture by cutting the tendon. In this case, after the skin opposite to the ring is cut, the stricture is to be taken off by dividing the tendon; after which the bowels may, by gentle pressure, be returned into the abdomen, without any danger of their suffering by being twisted; and the inflammation which follows the division of the tendon, especially if the sides of the incision

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(*f*) The ingenious M. J. L. Petit proposed many years ago to avoid opening the sac in the operation for certain cases in strangulated hernia, as appears by a posthumous work of his printed at Paris in 1774, in three volumes, *De Malad. Chirurg.* It has been reported that he afterwards relinquished this method, and “joined keenly with those who had opposed it;” but I find no proof of this in his posthumous work. But if we attend to his reasoning upon it in *Tom. II. p. 356*, where he lays down the following proposition, which not only appears at first sight paradoxical, but which cannot be founded on proper facts, and leads him, in *p. 359*, to a most dangerous and false conclusion, “*Qu’il est bon, pour réussir, que les parties aient été quelque tems à la gêne,*” to wit, “*Que ces opérations faites aux hernies sans étranglement, n’ont pas des suites si heureuses, que celles, qui sont faites aux hernies qui sont étranglées;*” we will readily perceive that Mr Petit did not perceive the chief advantages of the operation he proposed; I mean, that the danger in the common method of operating arises chiefly from the exposure of the bowels to the air: and as this material fact has been little better understood by various authors who have lately wrote on the subject, that method has been rejected by them on as slight foundation as that on which it was proposed by Mr Petit.

in the skin be joined by stitches, will scarcely be greater than where the skin alone is divided.

By the by, I would here observe, that the division of the tendon in the crural hernia is not attended with that degree of danger which some of the latest and most eminent writers have supposed (*g*), providing the edge of the knife be turned towards the umbilicus; in which direction both the epigastric artery and spermatic cord are at the greatest distance from it; and that the knife be used like a saw, dividing cautiously with it one tendinous fasciculus after another.

If, after dividing the tendon, the bowels cannot be easily returned into the abdomen, there may be room for suspecting that they are confined by a stricture of the neck of the sac, especially in the hernia congenita; which must therefore be in the next place removed.

If the herniary sac under the straitened place of its neck be thin and transparent, and that there is little or no reason to suspect an adhesion of the bowels with the sac, the best method will be to make a small hole in the sac below the stricture, and then to introduce a small furrowed probe, and to cut cautiously upon it: But if the sac be thick and dark coloured, and that there is likewise a suspicion that the bowels may adhere to it, the easiest and safest manner will be to make the hole in the peritonæum above the stricture; then to introduce a common probe, bent near its point into a semicircle; and to introduce this, with its point directed downwards, through the stricture into the sac; and, upon the point of it, to make with great caution another small hole; after which we may either cut upon the probe, or introduce a furrowed probe, and divide the neck of the sac (*h*).

AFTER

(*g*) Pott, p. 308.

(*h*) In a case of crural hernia to which I was called along with Mr Dewar surgeon, in 1772, the sac was thick and opaque, with a suspicion of adhesion; for which I proposed this method; and we executed

AFTER this the bowels are to be returned by pressure upon the sac, without opening it farther; and the wound in the skin is to be stitched so accurately, by passing the stitches about the breadth of the finger from each other, as to prevent the access of the air. The wound in the skin ought likewise to be dressed with large pieces of lint spread with simple cerate, and these should be covered with a compress.

IN the hernia congenita, where the bowels are in the same sac with the testicle, it is still more necessary than in the most common kind of hernia to avoid opening the herniary sac, as the inflammation of the testicle would add considerably to the danger.

IN the case of hernia congenita, which I treated along with Mr Clarkson in 1774, the testicle, which before the operation had been in a great measure concealed by the bowels descending to the bottom of the scrotum, was not so much inflamed during the cure as to be sensibly enlarged.

BEFORE I conclude, I cannot help taking notice of a want of accuracy in the late writers as to the manner of distinguishing the hernia congenita. Mr Pott, p. 311. says, " The appearance of a hernia in very early infancy, will
 " always make it probable that it is of this kind; but in an adult, there is
 " no reason for supposing his rupture to be of this sort but his having been
 " afflicted with it from his infancy. There is no external mark or character
 " whereby it can be certainly distinguished from one contained in a common
 " hernial sac; neither would it be of any material use in practice if there
 " was."

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executed it with little difficulty. It was likewise easily done in the operation I attended in 1782 with Mr Simpson and Mr Calderwood, and very lately in a case I attended with Dr Alexander Hamilton and Mr Andrew Wood surgeon.

INSTEAD of which, I would observe, 1. That a hernia that is not congenite may have continued from early infancy. 2. That a congenite hernia may be distinguished in an adult by an evident external mark; which is, that the bowels push down between the sac and the forepart and sides of the testicle, so as often, in a great measure, to conceal it; whereas, in the common hernia, every part of the testicle can be felt distinctly. 3. I would allege that it is of material use to make the distinction; because in whatever manner we operate in the hernia congenita, unless we take the utmost care to exclude the air, there will be a more violent inflammation and greater distress than in common cases, because the testicle will partake of the inflammation.

S E C T.

TAB. VIII.

Thos. Donaldson del^t

Geo. Cameron sculpt^r

S E C T X.

EXPLANATION OF TABLE VIII.

IN this Table the Structure is represented of the Fat and of the Organs, called Mucilaginous Glands, which secrete the Liquor of the Joints or Synovia, and the Liquor which lubricates the Bursæ Mucosæ.

F I G. I.

- A. The head of the os humeri.
- B B. The cut edge of the capsular ligament.
- C. A fimbriated organ, which in

F I G. II.

Is represented magnified.

F I G. III.

THE Secerning or Glandular Organ, which fills the Bottom of the Acetabulum, is here represented.

- A. Part of the round ligament of the thigh-bone.
- B. The middle part of the glandular organ covered with a vascular membrane.
- C. A small hard body, fixed by a peduncle, found in this subject.
- D E. Fimbriæ projecting from the edge of the glandular body.

IN

IN FIG IV.

THE Fimbriæ D are represented as they appear when viewed with a magnifying Glass.

FIG. V. AND VI.

REPRESENT Fringes hanging from the same Glandular Organ of another Subject, of the real Size, and magnified.

FIG. VII.

REPRESENTS a perpendicular Section of the same Glandular Substance: And,

FIG. VIII.

REPRESENTS that Part of it which was connected to, and cut away from, the Bone. In both Sections, Fat with Vessels appears; but no red or knotty Bodies were found intermixed with the Fat.

FIG. IX.

A B. The inner or back part of the patella.

C D E F. *Pelotons* of fat with fimbriæ, which are placed around the patella.

FIG. X. XI. XII.

REPRESENT the Fimbriæ delineated in Fig. IX. viewed with a magnifying glass.

FIG. XIII. XIV. XV.

REPRESENT the same kind of Fimbriæ in another subject.

FIG.

F I G XVI.

REPRESENTS, of the natural Size, the fatty fecerning Organ cut out from the Burfa between the Tendo Achillis and Os Calcis.

A. The root of the fatty substance.

B C. The fatty substance which projects into the burfa with its fimbriæ.

F I G. XVII.

REPRESENTS B C of last Fig. magnified.

F I G. XVIII.

REPRESENTS that Part of this fatty Substance which was connected to the Heel Bone. In it no red or knotty glandular Bodies, different from Fat, were distinguishable.

F I G. XIX.

REPRESENTS a small Portion of the subcutaneous Fat of the Human Body viewed with a Microscope, which increasēs its Diameter about thirty Times: And,

F I G. XX.

REPRESENTS the same viewed through a compound Microscope, which magnifies it to near one hundred and fifty Diameters.

THE oily matter is found to be contained in spherical or spheroidal shut sacs or follicles.

S E C T. XI.

EXPLANATION OF TABLE IX.

THE several Figures of this Table represent hard, elastic, cartilaginous Bodies found in the Burfæ, the Joints, or other shut Sacs of the Body.

F I G. I. and II.

SHOW the Fore and Back Parts of a cartilaginous Body, which, after an Incision, was extracted in 1778 from the Joint of the Knee of a living Person, by Mr F. Dewar Surgeon in Edinburgh.

F I G. III. IV. AND V.

REPRESENT three, of above twenty, such cartilaginous Bodies, which formed in the Knee-Joint of one Person.

F I G. VI.

REPRESENTS another of these cartilaginous Bodies bisected.

F I G. VII. VIII. IX. X. XI. XII. XIII. XIV. XV. XVI. XVII. XVIII.

REPRESENT, of the natural Size and magnified, a dozen of fifty such cartilaginous Bodies, which were extracted from the Bursa of the Flexor Pollicis Longus.

In one half nearly of the whole number, peduncles or filaments, by which
pro-

TAB. IX.

TAB. IX.

TAB. IX.

probably these bodies were attached to the bursa, are distinguishable. In the others, these bodies seem quite smooth.

FIG. XIX. AND XX.

REPRESENT a small, hard, cartilaginous Body, found in a Case of Hydrocele of the vaginal Coat of the Testicle, adhering slightly to the Testicle and Epididymis, of the natural Size and magnified.

FIG. XXI. XXII. XXIII.

REPRESENT three other such cartilaginous Bodies, of the natural Size and magnified, found within the vaginal Coat of the same Patient.

S E C T.

S E C T. XII.

EXPLANATION OF TABLE X.

THE First Figure of this Table represents the middle Part of the Arch of the Colon of an Adult, with a Hole eroded in it, in consequence of Dysentery; and hence the true Tympany was produced by the Air escaping from the Colon into the Cavity of the Peritonæum or Abdomen.

FIG. II. III. IV. V.

OF this Table represent two Holes formed in the Jejunum by Pins tied together, which had been accidentally swallowed.

IN all these figures,

A B. Represent the jejunum.

C. Its mesentery.

D E. An incision, by which the cavity of the jejunum is laid open.

F. Two large pins tied together, with their points turned different ways.

G. The point of one of the pins which had occasioned a hole in the jejunum, and was found situated as the figure represents it.

H. A hole which unquestionably had been occasioned by the point of the other pin; although on opening the body the pin was not found in the hole.

I K. Two membranous adhesions occasioned by the inflammation which the pins had excited; and by means of which the edges of the two holes in the jejunum were firmly fixed to L, a part of the mesocolon.

F I N I S.

TAB. X *Fig. 1.*

TAB. X. *Fig. 2.*

Fig. 3.

Fig. 4.

Fig. 5.

Tho: Donaldson del: et Sculp: