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On the Muscular Movements of the Organ of Vision.

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The eyeball is situated in a socket formed chiefly by the Frontal, Superior Maxillary, Ethmoid, Sphenoid, and Malar bones, and is in the form of a sphere having the segment of a smaller sphere engrafted upon its anterior aspect. Its various diameters are nearly equal, and measure about an inch in length. It is composed of tunic and humours, some of the former being both protective...
to the entire organ and essential parts as an organ of vision; the latter serving as refractive media.

The movements of this organ are very numerous, and serve in a most remarkable manner independently of their immediate uses to indicate the various emotions of the mind.

The muscles employed in effecting these movements, are simple in their arrangement, but beautifully complete in their combined action. The physiological arrangement by which these motions are accomplished form
a noted instance of what may be called Adaptive Physiology. Indeed, in no part of the system is this so fully exemplified as in the eye.

On each side of the eyeball, superiorly, inferiorly, externally, and internally, there is a straight muscle, arising from the margin of the optic foramen of the ethmoid bone and inserted into the sclerotic coat of the eyeball, about ¼ of an inch from the margin of the cornea.

The point of insertion of each muscle differs somewhat, and this has an important influence with reference to
the power of many of the antagonistic movements of the entire organ, as also with the results of division for strabismus. Besides these four straight (recti) muscles there are two oblique, the Superior and Inferior.

The Superior Oblique arises along with the straight muscles, but is different in its mode of insertion, being passed through a fibro-cartilaginous pulley situated in a depression of the frontal bone at the inner margin of the orbit, and thence being directed outwards and backwards between the eyeball and Superior rectus to be inserted into the
Sclerotica, midway between the Superior and External Recti.

The Superior Oblique is peculiar in being the only muscle arising from the floor of the orbit; it arises from a minute depression in the orbitale plate of the Superior Maxillary bone, and passes outwards and backwards between the Superior Rectus and floor of the orbit to be inserted into the Sclerotica at its external and posterior aspect.

The action of these muscles taken separately is simple and abundantly evident. Each
rectus turns the pupil towards itself, and two acting together turn it in a direction between that of the two forces.

The oblique muscles being inserted about the middle of the eyeball in its outer aspect (or side) produce simple rotation of the entire organ on an anterior-posterior axis, the rotation being upwards and inwards in the case of the Superior Oblique, and downwards and inwards in the case of the Inferior Oblique, their combined action serves to steady the eyeball.

If the rectus muscles act successively the
Tabular arrangement of the muscles, showing their simple and combined actions.

In studying the above it will be observed that the zygoal processes all the movements of an enthroidal articulation.
The eyeball is rotated, but the pupil is not as in the rotation by the oblique muscles looking directly forward, but is turned in the direction of that rectus which happens at the moment to be acting.

The amount to which all these movements can be carried varies in different individuals; the movement from side to side appears more extended than upwards and downwards.

The combined action of the recti muscles has been supposed by some to be that of retracting the eyeball within the orbit, an action which in animals is accomplished by a special muscle.
called the Retractor, in man the power of
retracting the eyeball is very limited, since
he is seldom called upon to protect his
visual organs by such an action, they being
sufficiently defended by the prominences of the
orbit, by the muscles, and lastly, though not
least in importance, by the protection of the
upper extremities so readily applied.
In fact, to accomplish this action there would
be required the strong and simultaneous action
of the four recte, which is not in accordance
with their general action. Moreover there
exists hardly any space behind the eyeball
Representation of the vitreous humour and the manner in which the vitreous humour passes through it (in sheep's eye)

1. Suprarenal Cyst
2. Vitreous Humour
3. Retina of posterior fundus of retina

Retina like manner for passage of vitreous.
to admit of this action, for though the roots which furnish the eyeball are yielding their elasticity is questionable, some Physiologists have thought that their action may by compressing the eyeball have something to do with altering the focus of the eye to adapt it for vision at various distances, and from the anatomical relations which we have stated as existing between the Recti muscles and the eyeball, this action would not appear improbable, it must however be borne in remembrance that the eyeball is separated entirely from its muscles by a peculiar tunica tenacea...
magnetically), the use of which, according to Mr. Ferrall, is to protect the eyeball from pressure and which must necessarily prevent very much any compression which might be affected by the recto muscles.

The combined action of the recti steadies the eyeball and prevents protrusion, as the oblique retraction while at the same time similarly steadying the organ.

Besides these general or simple movements so far ahead of the individual recti, there are other actions peculiar to certain kinds of
each individual muscle, and have reference
as previously hinted to the various results,
subsequent to the division of one or more of the
muscles for the cure of strabismus.

Until a very recent period it was the general
opinion, that the tendinous insertion of the recte
muscles were inserted at equal distances from the
circumference of the cornea. Mr. Lucas however
from many careful and very minute dissections
asserts, that from the globular form of the eyeball
the insertion of each muscle must be more or less
a fraction of a segment of a circle, the majority
being towards the cornea, and that from this
circumstance in the operation for the cure of
Arthritus, the operator may have supposed he
has completed the division of the plantar tendon, when
only half of the fibris had been; also that the Ethi
and Eth. Broci at their sections are nearly equal
in breadth, and that their insertion of the centres of
their tendons are nearly equal distant from the circumference
of the corneal, as also their outer edges, but that
their outer edges are more removed, being about
seven lines distant from the circumference of the cornea.

This last statement we are inclined to consider
rather exaggerated, for in those eyes which we had
an opportunity of examining the distance never exceeded
Diagram illustrating the mode of the insertion of the various tendons in relation to the circumference of the cornea.

1. Superior Rectus
2. Inferior Rectus
3. Interna Rectus
4. Externa Rectus

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<thead>
<tr>
<th>Tendon</th>
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five lines and a half. The centre of the tendon of
the Internal Rectus is distant from the Cornea
about three lines, its upper edge four lines, and
its inferior edge five lines. The tendon of the external
Rectus compared with that is as follows, the centre
of tendon from edge of Cornea five lines, superior and
inferior edges nearly six lines. The breadth of the
tendinous insertion of the Superior Oblique is greater than
that of the Superior Oblique is about two lines.
The breadth of the External Rectus compared with
the External is about one third more.
From this arrangement of the tendinous insertions,
it will be easily seen that the Superior and
Inferior recti though antagonists, have from the
mode of the insertions of their respective tendons a
greater tendency to direct the eyeball inwards.
Also that the Internal Rectus is more capable
of drawing the eyeball inwards than its opposite.
The External Rectus has in drawing it outwards,
And moreover that the upper fibres are more cap-
able of drawing the eyeball upwards than the
lower fibres have in directing it downwards,
This statement with regard to the External Rectus
is borne out by observations in the lower animals.
in whom notwithstanding every facility is afforded
for directing the eyeball inwards it is generally
of considerable magnitude.

When we direct our attention to the movements of both eyes, we find that they by no means admit of being demonstrated to satisfy activity as those of one organ, the consensual movements which they present cannot be ascertained by mere traction of the muscular fibre in the mesencranic subject. In fact, the question connected with the consensual movements of the eyeballs, is one which has perplexed physiologists not a little. It was easy enough to understand why the two superior recti, the two inferior recti and so on should...
act together, but why the same thing should not
have been observed of the external recti,
deemed explainable more on account of its con-
venience than by any physiological law.
In questions of this nature, careful examination
of the origins, courses, and insertions of the various
muscles, may show us pretty clearly the action
each has, and the effect produced by that
action in changing the direction of the pupil,
but something more is required, when we come
to enquire into the precise share each muscle
has in producing movements, where two or
more are implicated, and more particularly
when the movements of the two eyeballs do not coincide. In prosecuting such an enquiry, we are naturally led to ascertain what muscles are symmetrical, and what are symmetrical, and yet not condensed, and having done this to discover whence each muscle or class of muscles derives its nervous energy.

To facilitate such an enquiry, let us arrange in a tabular form the different muscles, specifying the kind of action peculiar to each class, and mentioning the nerves which
are distributed to them.

Muscles which are symmetrical and consensual.

Superior Recti  turn pupils upwards  supplied by III\textsuperscript{rd} nerve.
Inferior “  “  downwards  “  “ III  “
Internal “  “  downwards  “  “ III  “

Muscles symmetrical and not consensual.

External Recti  each turns pupil outwards  supplied by VI\textsuperscript{th} nerve
Superior Oblique  rotate eyes acting singly  “  “ IV\textsuperscript{th} “

In referring to this statement, it will be observed

that all of the muscles except the External Rectus
and the Superior Oblique of each eye are supplied
by the III\textsuperscript{rd} nerve, while these two muscles have
each a nerve to itself. This arrangement must have some important end which analogy may enable us to discover. If all the muscles were supplied by one nerve, we should find all corresponding muscles to act together, including of course the two External Recti. In order to see objects the axis of both eyes must be more or less convergent, hence while corresponding muscles of the two eyes are often required to act together, it as frequently happens that non-corresponding muscles must also act together, and consequently muscles which are contensual, but not corresponding (or symmetrical) must have a separate source of
The principal movements affected by the non-symmetrical muscles, is when one eye is turned outwards, and the other inwards, these being various modifications of the primary movement, as upwards and outwards, the other being upwards and inwards. The outward motion is effected by the External Rectus, the inward by the Internal Rectus, the Superior or Inferior Recte assisting when the pupil is turned in either of these directions.

Whatever be the modifications of action in these instances, it may be observed that the muscle
which turns the pupil of one eye outwards, is always differently supplied from that which turns that of the other eye inwards.

In the same manner, we can account for the action of the Superior Oblique in rotating the eyeball, when the head is turned to the side during gazing, as simultaneous with a similar rotary motion of the other eyeball, but performed by the Inferior Oblique; hence the necessity of each of these being differently supplied with nervous energy.

They may however
act together, in which case the eyeball is not rotated, but merely steadied.

It may be observed that the individual and conjunct action of the Oblique Muscles, has long been a subject on which there was much difference of opinion, and though Hunter in his work "Animal Economy" distinctly showed their action to be such as we have stated, yet to Dr. Edmonston is due the merit of confirming his views by direct experiments, which will be referred to hereafter.

If the uniformity of the direction of the two eyeballs be lost or destroyed,
from any cause, we have that peculiar appearance
denominated Strabismus (squinting), what the
precise pathological condition of the nerves and
muscles is we do not exactly know. It
done it is said to depend either upon
shortness of the muscle at that side to which
the pupil turns, or at some way to
inordinate contraction which may be either
absolute or relative; that is at may be from
an increased amount of Contractile power in the
muscle, or from deficiency of the same power
in its antagonist. Examination of the
hairs after death do not present anything
by which the problem could be solved.

One circumstance however is well worthy of
observation, viz. that the affected eyeball is not
paralytic, for if the other eyeball be pressed
it will be found to have its individual motions
quite perfect; it is obvious therefore, since
the independent actions of the eyeball are perfect,
that the defect is in the associated actions
of the eyeball, and that the organ is only
inactive when it ought to move conjointly
with its fellow the other eyeball.

Paralysis is therefore a disease in which
the uniformity of direction is more or less
absent. In some instances one eye only appears to be affected, and the direction of the pupil is generally inward. In others, both are directed inward and this form is termed strabismus convergens, in contradistinction to an opposite condition strabismus divergens, which however, in contradistinction, was confounded with the former. The cause of strabismus essentially depends upon the abnormal condition of one or more of the muscles of the eyeball; hence it follows as previously stated, it may assume various degrees of direction as also of intensity. That this abnormal action of the
Muscles may be variously induced to exist from the preceding anatomical and physiological remarks. Being muscles similar to those distributed in other parts of the body, they are liable to similar diseases. Atrophy from lesion of their nutrition, hypertrophy, and death they may undergo a complete change in their structure.

Besides this, it must be remembered that there exists between their chief source of nervous energy (the 3° Nerve), a connection with the sympathetic system which connection may account for the numerous cases of Atrophia.
Moreover, the relation existing between the bloodvessels and nerves with the brain may also point out the cause of strabismus in several central affections.

External evidence either to the eyeball itself or to the eyelids may produce strabismus.

Besides all these fruitful sources of squinting, we may trace it as the consequence of disease of the eyeball itself and its appendages, as for instance, corneal ulcers. While evidently the squint was induced by Nature attempting to obviate the mischief by causing the eyeball
to assume that position most favourable for the reception of the rays of light, which though not falling on the accustomed point of the retina, still from habit the individual sees equally well with both, and through lapse of time is not affected with double vision.

Injuries of the muscles of the eyeball seldom happen and this is attributable mainly to their position, and the admirable manner in which they are protected by the surrounding tissues.

Luscitas (prostertoria of the eyeball) is that abnormal condition in which the pupil is directed in a
Particular direction, and permanently fixed in this assumed direction, like the affections of the muscles it may assume various degrees of intensity. This affection is distinguished from Strabismus by the following circumstance. In Strabismus the eyeball is movable whereas in Esotropia it is permanently fixed, and in order to observe objects the head must be rotated to a more or less extent. The cause of this affection may be various as is evident when we recall to remembrance the remarks made when treating of Strabismus.

Esotropia is a rotary motion of the eyeball as if produced by the action of the Oblique
Muscles, it is a rare affection and when it does occur, its extent may be various; it is not unfrequently complicated with Amaurosis, or Cataract. What is remarkable and one which we would not suppose the influence of this affection on destroying vision or even diminishing it is comparatively little. The slight tremulousness of objects viewed being the only symptom complained of. The cause of this affection has been alluded to some to the deficiency of fragmentæ nigrae, whereas it does present itself it will invariably be found associated with some Central affection.

[Some text is not legible]
Nystagmus is an affright state to haleth, its onset being suddenly in the Readi Munders, Palsy of the Munders in connection with some abnormal condition of the 3rd nerve is a very frequent complaint, it may be remarked that almost invariably the 5th nerve and 6th nerve retain their natural power notwithstanding the 3rd nerve is affected.

Having completed what we have to say with regard to the movements, physiology, associations, and uses of the Munders of the eyeball we proceed to make a few observations on the gleaders.
and eyelids.

The eyebrow is the arched prominence which overhangs the eyelids, and constitutes the inferior margin of the forehead; it is composed for the most part of bone and muscles: muscle.

The portion of bone is called the supra-orbital ridge of the skull, on the surface of which is situated the corrugator supercilii muscle, which is made up of a considerable band of muscular fibers and is about an inch in length. Its action is well shown in frowning; in fact its action is more subservient as an organ of expression than of vision. Also more pathognomonic, than of a
physiological condition, over the superciliary ridge a number of hairs is implanted, the use of which is evidently to prevent the entrance of foreign matter, as well as to modify the degree of light.

The eye-lids (palpebrae) are a thin movable almost transparent kind of curtain, which close the anterior aperture of the orbit. They are composed of cartilage, muscular fibres, mucous membrane and integument; they are concave on their posterior aspect, convex on their anterior, in order to adapt them to the form of the eyeball. They are separated from each other by a transverse slit, the degree of separation being various according
The movements of the eyelids are accomplished by three muscles, two of which are situated exterior to the orbit, the other interiorly. The latter (the levator palpabrae superioris) arises from the margin of the optic foramen passing forward to be inserted into the upper eyelid by a broad tendon.

When the eyelids are closed, the levator muscle raises the upper eyelid and draws it from the lower eyelid.

If we watch the motions of the eyelids when the eye is opened, it will be observed that the motion is almost restricted to the upper eyelid; Sir C. Bell asserts that this muscle raises the upper eyelid; it also depresses
the lower eyelid, and he tries to explain the manner
in which it accomplishes such, to its position over the
eyeball, which must be more or less pressed forward
when the muscle is in action, and that the lower
lid will merely slide off the convexity of the eyeball.

Ocularis Palpebrarum, is the antagonist of

the previous. It consists of a number of circular
fibres; its action is like a sphincter. It serves
also to wash off foreign particles that may fall
on the surface of the eyeball... the tears or are
of its action moved on to the lacrimal duct.

Tensor Tarsi' is a small muscle connected with the

transducens lacrimalis whose function would appear to
be that of drawing the puncta inward, thereby facilitating the passage of the tears through them into the ductus. The muscles of the eyelids may be variously affected. The following are the most frequent abnormal conditions.

Mastic Mictitation is the alternate contraction and relaxation of the levator palpebrae carried to such a degree as to be observed by others, as well as by the patient, a minor grade of this affection is termed "twitching of the eyelids." The causes of both these affections are undoubtedly similar, only differing in degree, they are generally associated with a high degree of nervous sensitiveness, as in Hysteric h"
Paraly of the muscles of the eyelids is also liable to occur as the result of some diseases of the brain or its connections, to enter into a full detail concerning which at present is not our object.

Ptosis an incapability of raising the upper eyelid which may depend upon a variety of causes. It may be as the result of wounds, injuries, hyperophy, congenital, chronic and lasting but by no means the most frequent paralysis.

From the above remarks it will be evident that the treatment of this affection will be somewhat varied at one time local and at another, constitutional and partly both may be
enforced, and we regret to say that all too frequently fail to produce a happy result.

The movements of the internal parts of the organ of vision.

That the eye in a healthy state possesses a power of accommodation, by means of which it is capable of distinct vision of objects at various distances, is acknowledged by most writers, but how to account for this adjustment has puzzled all observers. Theories innumerable and exceedingly ingenious have been brought forward, and thereby supported by their various profounder, notwithstanding which we must concern with Sir David
In the following observation, "Although the most distinguished philosophers have contributed their optical skill, and the most acute anatomists their anatomical knowledge, yet understanding, all their combination of sense, the subject is as little understood at the present moment as it was in the days of Helvetius who first attacked the situation of the problem."

That an adjustment is necessary to perfect vision is amply illustrated by the following.

If we shut one eye and look with the other we are unable to see at the same time distinctly two objects, one of which shall be near, the other
more remote, both however placed on the axis of vision, as for instance, we place two lighted candles distance from each other about two inches, and from the eye about fourteen feet, and place another lighted candle about eighteen inches from the eye; all the candles being nearly in the same line. Now if we look at the candle nearest us, the flames of the remote candles look blurry, and almost as if one flame, but if we look at the remote candles the flames become quite distinct.

Judging from this inapplicability of seeing remote and proximal objects distinctly at the same time, it is evident that we can only view portions of
an object distinctly; the other adjacent parts appearing confused though situated at precisely the same distance. On this circumstance De la Hire advanced his theory of adjustment as being accomplished by the motions of the pupil, that there is some truth connected with the circumstance we must admit, in understanding it does not necessarily refute the necessity of adjustment by other means.

II In the advanced period of life when the functions of the human body are more or less diminished in activity, the power of accommodating the eye to proximate objects is lost; distant objects are best seen, near objects only by an effort, which is more or
less attended with pain. In the microscopic eye the capability of making this effort, i.e., to see near objects, is for the most part completely destroyed.

III. The analogy of the eye to delicate instruments in which objects are seen the clearer when brought to focal points, but it must not be supposed that we see only when the rays of light come to a or focal points on the retina, the difference between distinct and perfect vision is directly obtained to such a view.

IV. If we observe the difference of refraction in water, compared with that in air, it is obvious that the focal point at the retina, the eye being in air, will fall.
on a point beyond the retina, the eye being in water.

Hence it may from analogy be justly supposed that a power of accommodation exists, the mechanism of which however not being so evident in man, as in these animals and birds, which seek their prey in the water.

The experiment of Scheiner (which is so well known that we need not explain it) also points out the necessity of an accommodating power, in as much as it shows without such a power the image of an object would in certain cases either fall in front of the retina or behind it. Young's Retinex may be said to be founded on the principle of this experiment.

Having mentioned the various
circumstances indicating the necessity of accommodation, we now come to consider how this is effected. As already stated, many hypothesis have been promulgated, all of which are liable to objections; the following are the principle and regarding which we shall make a very few remarks.

I have considered it due to a shortening of the radius of the curve of the cornea, experiments and actual observation have not sufficiently demonstrated this to be the fact.

II An elevation of the axis of the eyeball instead of the action of the muscles of the eyeball. The experiments of Sir E. Home show that no contraction or movement
of the eyeball takes place by the action of the muscles. Moreover, the relation between the muscles and the thence vaginae uteri renders this view rather doubtful.

III. A change in the connexity of the lens by the capsule or fibers of the lens. This hypothesis we think to be entirely without support, inasmuch as the fibers of the lens are totally different from those of muscles. Moreover no nerves can be traced to it, and supposing we acknowledge the musculinity of the fibers, it is questionable from their mode of arrangement if the connexity of the lens could be increased.

IV. The movement of the lens to the cornea. This hypothesis in our opinion appears to be the most probable.
at all events the only one supported to any extent by anatomical observations. For within the globe of the eye we find a peculiar structure, (ciliary muscle) which in all probability is muscular in the human eye, at all events as such in some of the lower animals, Monoscopic observations show that in structure it is like muscle, that it has nerves, and these derived from the 3rd. As regards its position being in close proximity to the lens, the eye being in remembrance all these anatomical relations to, it is by no means a high flight of the imagination to suppose that the action of this ciliary muscle is to bring the lens towards the cornea. Mr. Bowman
thinks that this action may be materially assisted by the peculiar direction of the relaxing muscle fibres on the anterior portion of the iris in humans.

The Movements of the Iris.

Under ordinary circumstances the contraction of the iris is a reflex action, which may be explained by an impression on the retina being conveyed along the ophthalmic nerve to the brain, whence reflected to the iris by the 3rd nerve. Moreover both irides will contract under the reflected stimulus of only one retina.

The motions of the iris are also associated with
Certain muscles of the eyeball, hence it is explained, by some
the remarkable phenomenon of the motion of the pupil being
quite perfect, notwithstanding the presence of total blindness
and insensibility, namely, that there is an attempt to
contract in association with the muscles supplied
of the 3rd nerve.

The movements of the iris also seem dependent
on the 5th for division of its motility. Section
is followed by contraction, and insufficiency of being
moved by light, in any degree of intensity. The cause
of this is hitherto unknown.

That a diseased brain should retain the power
of communicating to the 3rd nerve the impulse
sequent for the induced motions of the iris has attracted
the attention of many physiologists. The explanation
brought forward by Dr. MacKenzie appears to us
very satisfactory, he says that from the association
which undoubtedly exists between the iris and
the nerves, disease affecting the origin of the iris
nerves or affecting any part of the iris tract between
its origin and the communication with the 3'd mena
(whenever the communication may be) will produce
blurriness, but may leave unimpaired the influence
of the iris nerves upon the 3'd mena and upon the
posterior of the iris.

If this view be correct we can account for the
Motives of the pupil in Ammonia: the result of division in the Cerebellum, it will also account for the motion of the pupil of an amnestic eye; when the amnestic healthy eye is exposed to the stimulus of light.

Having finished this short account of the various muscular movements observed in connection with the organ of vision, it may not be unprofitable to present an epitome of some experiments, carried on by us with a view to determine the action of the different muscles. The experiments were performed on the eye of the dog. It may however be premised...
that experiments on the lower animals are not so satisfactory as could be desired, and this is attributable chiefly to the following circumstances: viz. the unlikelihood of making the animal so direct its eyes in a particular direction to see the result of an experiment. Also, that the actions of the different muscles are more or less modified by a muscle called the Retractor (which is absent in man) the function of which is to retract the globe, keep it in position, and is invariably present in these animals whose head is generally in the dependent posture.

Notwithstanding these are obstacles of
Considerable importance, it must however be acknowledged that experiments on the lower animals often present us with facts of no mean practical utility.

Experiments

I. Division of Superior Rectus.

Result. The direction of the pupil was not changed. The power of directing the pupil upwards seemed to be entirely lost.

II. Division of Inferior Rectus.

Result. The direction of the pupil scarcely underwent any change; the power of directing the pupil downwards lost.

The result of these experiments was not such as I had anticipated, can the absence of action in the antagonistics muscle be due to the retractor?

III. Division of External Rectus.

Result. The pupil directed to the inner angle of orbit, and remained there, pupil very much contracted.
The dogs were killed after the experiments and the brains examined in order to see if the proper muscle or muscles had been divided for each experiment.
IV. Division of Inferior Rectus.

Result: Pupil directed outwards, yet not to so great an extent
as the pupil was directed inwards in the former experiment.

V. Division of all the Recti muscles.

Result: Pupil slightly directed inwards, remaining stationary. The eyeball
appeared somewhat prominent in attempting to resist alteration
in producing the accommodative motion of the pupil, especially
at first.

VI. Division of Superior Oblique, all the other muscles normal.

Result: Pupil directed a little out of its normal axis. The amount of
rotation or oblique of any was difficult to determine. We would
be inclined to say that they all remained in its normal position.

VII. Division of Inferior Oblique, all the other muscles normal.

Result: Somewhat similar to the above, on offering a piece of meat to the dog,
he invariably grabbed a little above or below the meat. The sense of smell
however formed part of him right, thus we say there due due to double vision caused the area of vision
being changed, in the one so that the corresponding parts of the retina also act in
the same horizontal line to accomplish which at the function of the oblique muscles

VIII. Division of both Oblique Muscles, the other muscles normal.

Result: Pupil remained in its normal axis

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Dr. Johnson's Experiment—In order to prove
Hunter's view of the action of the Oblique was as follows. Immediately after the dog was killed the Oblique muscles were exposed. The surrounding structures being disturbed as little as possible.

On passing a current of galvanic battery through the Superior Oblique, a piece of paper placed at the outer margin of cornea was directed upwards and inwards.

On subjecting the Inferior Oblique to a similar current, the piece of paper was directed downwards and inwards. The pupil in either case
was not directed out of the normal axis.

The foregoing experiment of Dr. Gowers's, though simple, is abundantly evident, for if the existence of such a movement be only acknowledged, the necessity and functions of the oblique muscles must be obvious to all, seeing as we have heretofore mentioned, that the recto muscles are incapable of affecting a similar movement.

Ernis