ALL ABOUT EXTRA OCULAR MUSCLES – EASY TO UNDERSTAND

PARTHA HARADHAN CHOWDHURY[1]

BRINDA HAREN SHAH[2]

NRIPESH TIWARI[3]

[1]M.OPTOM, ASSOCIATE PROFESSOR, PRINCIPAL

Department of Optometry, Shree Satchandi Jankalyan Samiti Netra Prasikshan Sansthan Pauri, Affiliated to Uttarakhand State Medical Faculty, Dehradun, India

[2]M.OPTOM, Practitioner, Ahmedabad, Gujarat, India

[3]D.Optom, Chief Optometrist, District Hospital Pauri, Government of Uttarakhand

CORRESPONDING AUTHOR:

PARTHA HARADHAN CHOWDHURY, M.OPTOM, ASSOCIATE PROFESSOR, PRINCIPAL, Department of Optometry, Shree Satchandi Jankalyan Samiti Netra Prasikshan Sansthan Pauri, Affiliated to Uttarakhand State Medical Faculty, Dehradun India

ABSTRACT:

This paper describes about Anatomy and Physiology of Extra Ocular Muscles.

INTRODUCTION:

Extra Ocular Muscles are the solely responsible for the ocular movements. There are four Rectus muscles & two oblique muscles.

Name of the Four Rectus Muscles are:

1. Superior Rectus Muscle
2. Inferior Rectus Muscle

3. Medial Rectus Muscle
4. Lateral Rectus Muscle

Name of the Two Oblique Muscles are:

1. Superior Oblique Muscle
2. Inferior Oblique Muscle

- The meaning of the "Rectus" is "Straight." That's why; its name is "Rectus" because its course or pathway is completely straight.
- The area difference between Rectus and Oblique muscle is called "Tug of War".
- Where all the "Rectus Muscles" are inserted that's shape is like "Spiral". That's why it is called "Spiral of Tillaux"
- To recapitulate about the insertion of Rectus Muscle, always have to remember this short form = "M I LS"

M = Medial Rectus Muscle
I = Inferior Rectus Muscle
L = Lateral Rectus Muscle
S =Superior Rectus Muscle

From the Limbus, the insertion will be
Medial Rectus = 5.5 mm
Inferior Rectus = 6.5 mm
Lateral Rectus = 7.0 mm
Superior Rectus = 8.0 mm
Always it is remembered that where muscle and sclera is inserted that is "Horse Shoe shaped Configuration."
All the Rectus muscle is inserted anteriorly on the Globe, that's why pulling function occurs.
All the Oblique muscle is inserted posteriorly that's why pushing effect occurs.

The origin of the four Rectus Muscles is: Orbital Apex at the annulus of Zinn.

The origin of the 2 Oblique Muscle is:

Superior Oblique:

It has two origins

- 1st one is Orbital apex, just above the Annulus of Zinn
- 2nd is Functional origin at Trochlea.

Inferior Oblique:

It has two origins

- 1st one is Lacrimal fossa.
- 2nd is Neovascular bundle acts as a functional origin.

BRIEF DISCUSSION ON RECTUS MUSCLE AND OBLIQUE MUSCLE

Rectus Muscle is subdivided into two types:

HORIZONTAL MUSCLE	• MEDIALRECTUS • LATERALRECTUS
VERTICAL MUSCLE	• SUPERIORRECTUS • INFERIORRECTUS

FUNCTION:

At primary position:
Medial Rectus - Only Adduction
Lateral Rectus - Only Abduction.

It is to be remembered that at secondary position of the eye Medial Rectus & Lateral Rectus plays a role about Supra & Infra version/duction. Example In case of "A-V" phenomenon Transposition is needed for Medial Rectus Muscle & Lateral

Rectus Muscle. The meaning of the Transposition is "Vertically" 'Medial Rectus Muscle & Lateral Rectus Muscle' is displaced. During "A-V" phenomenon, Medial Rectus Muscle is displaced towards the "Apex" side & "Lateral Rectus Muscle" is displaced towards the "Widening side."

At primary position of the eye Medial Rectus has only Adduction and Lateral Rectus has only Abduction due to in this position visual axis & muscle axis creates '0' degree angle or Parallel position.

At primary position Vertical Rectus Muscle functions are:

SUPERIOR RECTUS
- ELEVATION
  - PRIMARYFUNCTION
- ADDUCTION
  - SECONDARYFUNCTION
- INTORSION
  - TERTIARYFUNCTION

INFERIOR RECTUS
- DEPRESSION
  - PRIMARYFUNCTION
- ADDUCTION
  - SECONDARYFUNCTION
- EXTORSION
  - TERTIARY FUNCTION

At primary position Vertical Rectus muscle have three functions due to visual axis & muscle axis creates 23 degree angle.

Always it is being remembered that, there is also be a chance to have only one function of Vertical Rectus [Superior Rectus +Inferior Rectus] muscle. When visual axis & muscle axis are parallel. Then Superior Rectus has only “Elevation” & “Inferior Rectus” has only “Depression”. When Vertical Rectus [Superior Rectus + Inferior Rectus] muscle axis cross the 23 degree angle at primary position then secondary function will be tertiary function & tertiary function will be 2ndary function.

MEDIAL RECTUS MUSCLE:

It is innervated by lower division of 3rdCranial Nerves. It should be remembered that there is no attachment with any Oblique Muscle to Medial Rectus Muscle. So, during Pterygium surgery, there are chances to lost Medial Rectus muscle and quite impossible to find it if lost.

LATERAL RECTUS MUSCLE:

It is innervated by 4thecranial nerve. By the connective tissue, Lateral Rectus is attached to Inferior Oblique. There is very important anatomic Relationship. During Lateral Rectus muscle surgery, if it is lost, then at the Insertion area of Inferior Oblique muscle, again Lateral Rectus can regain it.

SUPERIOR RECTUS:

It should be always remembered as

$LR_6SO_4ALL_3$

Where,

LR = Lateral Rectus Muscle

6 = VIthcranial nerve

SO=Superior Oblique Muscle

4= IVth Cranial Nerve

All = All muscles except Lateral Rectus and Superior Oblique

3 = 3rd Cranial Nerve

SUPERIOR RECTUS

Superior Rectus muscle is innervated by upper division of the 3rd cranial nerves. Always it is remembered that

(S---S) is followed

S = Superior Rectus muscle

S = Superior Oblique Muscle

Superior Oblique Muscle Tendon is overlying on the Superior Rectus Muscle.

INFERIOR RECTUS

Inferior Rectus is innervated by the "Inferior branch of the 3rd cranial nerves"
Always it is remembered that
I = I is followed
I – Inferior Rectus Muscle
I = Inferior Oblique Muscle
Inferior Rectus is attached to "Inferior Oblique" by the facial connection.

OBLIQUE MUSCLES:

At primary position.
Oblique Muscles have also three functions due to the angle between visual axis & muscle axis is 51 degree.
To recapitulate the muscle function of the Oblique Muscle: All oblique muscles are
'Abducted'
"I-I" not possible it means
I = Inferior Oblique Muscle
I = Intorsion
It is not possible.
So,

INFERIOR OBLIQUE

- EXTORSION
  - PRIMARYFUUNCTION
- ELEVATION
  - SECONDARYFUNCTION
- ABDUCTION
  - TERTIARYFUNCTION

SUPERIOR OBLIQUE

- INTORSION
  - PRIAMRYFUNCTION
- DEPRESSION
  - SECONDARYFUNCTION
- ABDUCTION
  - TERTIARYFUNCTION

SUPERIOR OBLIQUE MUSCLE:

It is innervated by the trochlear nerve. It is originated from the "just" above the annulus of zinn & at the orbital apex. Its functional origin is "trochlea." It have longest tendon and it is 26 mm.Always it is remembered that "Superior Oblique" muscle is innervated by nerve at the "Only surface of the Muscle Belly" that's after Retro bulbar Anesthetic block all the muscles are become in "Muscle Akinesia" except "Superior Oblique" that's why eye is become mild 'to and fro' condition.

INFERIOR OBLIQUE MUSCLE:

It is innervated by the 3rd cranial nerves. It has also two origins

- Lacrimal fossa
- Neovascular bundle

To recapitulate (I-I) is followed:

Inferior Oblique muscle is attached to the Inferior Rectus muscle with Lateral Rectus muscle also via Lock wood's Ligament.

REFERENCES:

1 Kenneth W. Wright (2006), Handbook of Pediatric Strabismus and Amblyopia. 2nd (Edn.).
2 William J Benjamin (2006) Borish's Clinical Refraction 2nd (Edn.).
3 Theodore Grosvenor, Theodore P Grosvenor (2007) Primary Care Optometry. 5th (Edn.).
4 Sir Stewart Duke-Elder, David Abrams (1978) Duke Elder's Practice of refraction.