MODIFIED DUAL APPROACH FOR THE PROSECTION OF HUMAN ORBIT TO PROCURE THE ORBITAL CONTENTS

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ABSTRACT: BACKGROUND: Requirement of the good specimens of human eye showing all its muscles from their origin to insertion, optic nerve and ciliary ganglion has been always felt during the teaching of anatomy of human eye. **AIM:** To make Museum specimens of human eye showing eye ball with its muscles, nerves, vessels, ciliary ganglion and optic nerve for teaching of surgical and gross anatomy. These specimens may help in formation of better eye prosthesis used in the field of ophthalmic plastic surgeries. **MATERIAL AND METHOD:** Five cadavers were marked for procurement of specimens during routine dissection in dissection hall by undergraduates. Cranial vault and brain were already removed. Roof of orbit were removed by superior approach with preservation of apex with cone of muscles and optic nerve. Removal of superciliary arch with frontal approach was followed to obtain complete eye ball and other structures. Fine dissection was performed to clean the area for demonstration. Specimens were mounted by Kaiserling's technique in glass jars. **RESULT:** By this method ten specimens of eye were mounted showing all muscles with their origin and insertion, their nerve supply, optic nerve, ophthalmic artery and its branch entering into optic nerve in different views of different specimens. **CONCLUSION:** Ten specimens were procured from five cadavers dissected routinely in dissection hall by undergraduates. These specimens are providing a very good 3- dimensional view of eye and related structures. An interactive method of teaching using prosected specimens is raising a good satisfactory level among students.

KEY WORDS: prosection, museum specimens, ophthalmoplastics

INTRODUCTION: Anatomy is the basic for medical education. There are various methods of teaching anatomy. Prosected specimens are one of the best modes of teachings, more interesting than a lecture in a lecture theatre[1]. Although Anatomy research and teaching has taken advantage of technology developments and is towards a more enlightened future, yet museum and prosected specimens have their own importance. Though dissection of orbit and eye provide knowledge, still study of a prosected specimen of eye before dissection can make a 3-dimensional view in mind and can lead to a better dissection.

It has found that during routine dissection usually conventional superior approach for dissection of orbit is followed after removal of brain. Students try to see the different structures from this view. Because of presence of orbital fat, all contents of orbit are difficult to visualize in a single cadaver provided for dissection on one table. Whole procedure requires a lot of patience. Due to this, lack of interest for fine dissection of orbit was seen among students. At the same time, if prosected specimens of eye are used, they will develop a state of curiosity to find out the structure demonstrated in specimens.

MATERIALS AND METHOD: Five cadavers having good signs of embalming were selected for procurement of specimens. They were dissected at the time when the cranial vaults were removed and brains were taken out during routine dissection. Cranial fossae were visible. The whole procedure upto mounting of specimen was completed in three months duration. This work was done in the Dissection Hall of department of Anatomy, Rajasthan.

The Instruments used for the dissection were chisel, mallet, bone cutter, bone retractor, scissors (straight and curved), forceps (plain, toothed, pointed) and dissecting microscope. Disposable syringes of 10 ml with disposable needles were required for filling formalin solution in the eye balls to keep them inflated. Dissecting microscope was used to obtain a better view for dissection.

The approach followed which was simply a combination of conventional frontal and superior approach used for the dissection of orbit (Cunningham manual of dissection) with an addition of removal of superciliary arch[2-4]. The calvaria of the cadaver had been already removed in this study. Periosteum of anterior cranial fossa is stripped out except over the cribriform plate of ethmoid bone. Orbital plate of frontal bone is removed with the help of a gentle tap from a mallet on a chisel. This exposed the orbital periosteum (periorbita, orbital fascia) and was divided transversely and antero-posteriorly taking care not to damage any structures beneath it; procedure similar to the conventional approach[2-4].

All rectii muscles are attached to the corresponding margins of common tendinous ring (CT ring). CT ring is a fibrous ring, which surrounds the optic canal and part of superior orbital fissure[5]. This ring with attached muscles forms a cone which is to be kept intact. For this, remains of lesser wing of sphenoid were removed leaving a wide margin of bone around optic canal, apex of orbit and common tendinous ring. Due to this, optic nerve and the cone of muscles remained attached to each other and were intact. Frontal nerve on Levator palpebrae superioris, Trochlear nerve at medial and lacrimal nerve at lateral aspect of orbit were identified. Stumps of nerves with vessels, entering or exiting from middle cranial fossa to orbit and vice versa, near the apex of orbit were cut in middle cranial fossa leaving attached short stumps towards apex. This rendered orbital contents freed from structures in middle cranial fossa.

Contents of the orbit with eye ball were freed from medial and lateral walls of bony orbit with the help of a finger and back of a blunt forceps. Trochlea of Superior oblique, attached to trochlear fossa of frontal bone was detached with the help of a scalpel. Finger or forceps was introduced from inner aspect of orbital fascia. Structures fixing eye ball to orbit; either nerves, vessels or connective tissue entering or exiting orbit; were gently detached by cutting with a scalpel.
Now, a modified anterior approach with removal of superciliary arch was followed. Superciliary arch was removed with the help of mallet and chisel. Upper eye lid including eyebrow was cut and separated. Anterior covered margin of eye ball was detached by introducing a finger or back of a blunt forceps. During this procedure, Inferior oblique muscle was cut from its origin and bony attachments of check ligaments (lateral check ligament from whitnall tubercle and medial check ligament from lacrimal crest) were detached.

Finger or back of a blunt forceps was inserted as posterior as possible at floor of orbit towards apex. Contents of orbit with eye ball were completely detached from inferior wall of bony orbit and removed out with all orbital muscles and short stumps of related nerves.

Now, a fine dissection was performed to clear and to show contents. Eye ball was inflated with 40% formalin solution by using 10 ml disposable syringes with needle. By using this newer approach, ten specimens were prepared. Structures were painted and named by oil colours. Specimens were prepared to show different parts. For example, one specimen was prepared to show ophthalmic artery crossing optic nerve from lateral to medial side (figure no. 1). For this, Levator palpabrae superioris and superior rectus muscles were cut. Orbital fat and small vessels except a part of ophthalmic artery crossing optic nerve were removed. Similarly, to prepare other specimens, related dissections were performed. Different other specimens showing muscles of eye balls, optic nerve and ciliary ganglion, lateral rectus muscle along with its nerve supply, superior oblique with the trochlea and its nerve (figure no. 2), inferior oblique separated from its origin (figure no. 3) were prepared.

Prosected Specimens were mounted in glass jars by Kaiserlings technique. These specimens were obtained from embalmed cadavers kept in formalin tanks. Thus fixation had already occurred. Specimens were now kept in Kaiserling solution No.2 (80% Industrial alcohol) for 2 hrs to restore the colour lost due to fixation. Specimens were again washed in water and then mounted in the glass jar containing freshly prepared and filtered Kaiseling solution No.3 (40% Formalin 50 ml, Potassium acetate 500 ml, Glycerol 3 L, Distilled water 9 L). Specimens prepared by this method can be used for academic purposes[6].

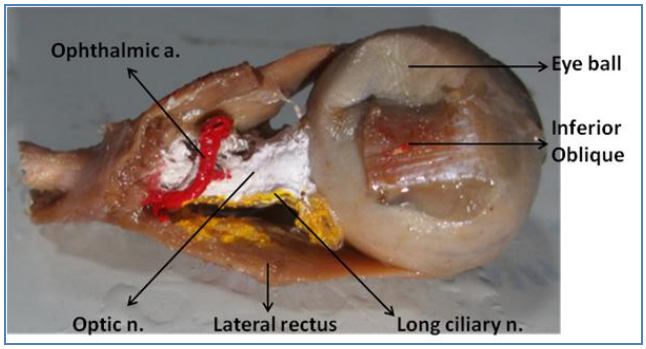

Figure no. 1: Specimen showing ophthalmic artery crossing optic nerve from lateral to medial side.

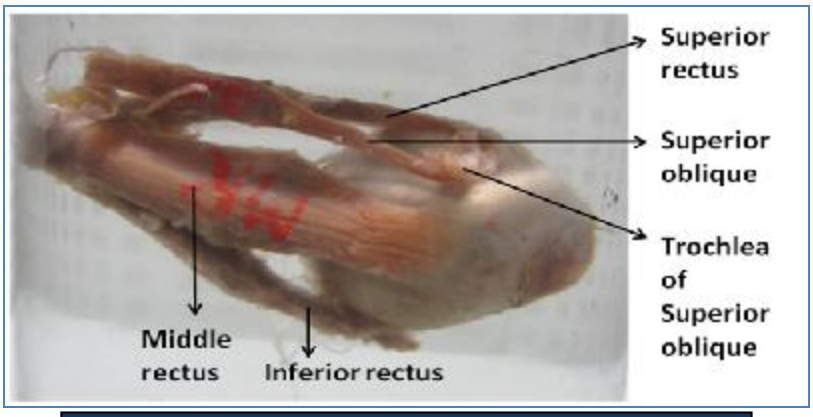

Figure no. 2: Specimen showing superior oblique muscle with the trochlea and its nerve.

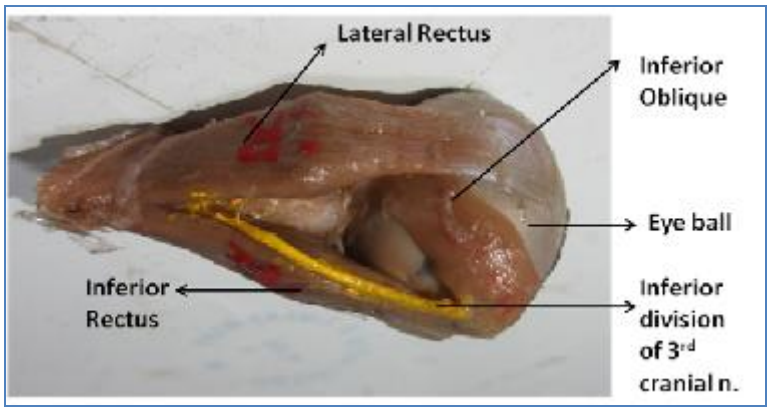

Figure no. 3: Specimen showing inferior oblique separated from its origin.

DISCUSSION: In the latter half of 20th century, increasing demands on healthcare system has led to train more doctors. Anatomy department of different colleges have to accommodate the growing number of students and hence feel the importance of prosection over the dissection.

Tracy L. Kivell et al, in 2009, described an interactive method for teaching anatomy of the human eye for medical students in ophthalmology clinical rotations. They provided a method of dissecting porcine or pig eyes to a small group of students with a review of human anatomy.

Conventional superior and anterior approaches are described in Cunningham's Manual of Practical Anatomy and Grant's Dissector[2,3]. Conventional superior approach of dissection of orbit although provide a good gross anatomical view of orbit and its contents but it needs an additional way of dissection to review each and every part. Still inferior region of orbit is either not approached or is a very time consuming procedure. Similarly anterior approach lacks a complete view of orbit and is not followed in routine practice. Both these approaches with another lateral approach can provide a complete view but need too much time and patience. Further, any of these methods either separately or combined do not provide a good procurement of specimens that can visualize different contents of orbit.

Prosection makes more efficient use of a cadaver as compared to dissection and allows more flexibility. Presented method in this article provides an easier and fruitful approach to dissect and procure specimens of the eye.

CONCLUSION: Modified dual approach of dissection of the orbit combines the conventional superior and frontal approaches with the removal of superciliary arch. This provides an easier and better way for the procurement of specimens of human eye showing the orbital contents. These prosected specimens provide a better view of human eye anatomy to medical undergraduates and postgraduates as well as paramedical students during anatomical demonstrations and lectures. Specimen showing Superior oblique muscle along with its trochlea and the position of inferior oblique will help in understanding the actions of these muscles. Integrated teaching with prosected specimens and embryological models will make the teaching of Anatomy easier. These prosected specimens may also help in formation of better eye prosthesis used in field of ophthalmoplastics.

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