

## A METHOD FOR REMOVAL OF BRAIN, BRAIN STEM WITH SPINAL CORD AS ONE UNIT FROM HUMAN CADAVERS FOR ANATOMICAL STUDY AND MUSEUM PURPOSES

Subhash Bhukya<sup>1</sup>, Merlin R Thomas<sup>1</sup>, Alok P Acharya<sup>2</sup>, A Manitombi Devi<sup>2</sup>, A Banerjee<sup>1</sup>

<sup>1</sup>Assistant Professor, Dept. of Anatomy, Armed Forces Medical College, Pune

<sup>2</sup>Resident, Dept. of Anatomy, Armed Forces Medical College, Pune

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**Corresponding author:** Subhash Bhukya

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### Abstract

After successful embalming of the 05 human adult cadavers, removals of brain, brain stem with spinal cord were done as a single unit. The removal of bilateral laminectomy of vertebrae helps in viewing of spinal cord with its coverings and spinal nerve roots, dorsal root ganglion and cauda equina. It is followed by removal of vault of skull, squamous part of occipital bone and posterior arch of atlas, helps in viewing of brain, brain stem along with dural sheath and venous sinuses. This approach helps in total removal of brain, brain stem and spinal cord with its covering with large venous sinuses remaining intact however small venous sinuses are sacrificed in this process. The specimen thus obtained can be used for anatomical study and museum display.

**Keywords:** Removal of brain, brain stem, spinal cord, anatomical study.

### Introduction

In a conventional approach for removal of brain and brainstem was beginning with removal of scalp en masse and then a saw cut around the bare skull bones. The procedure results in inevitable damage to the brain stem and dura with some of the nerve roots being severed and clear visibility of the posterior fossa is not possible - a limitation of this procedure. On above view an alternative approach for removal of brain with spinal cord has been contemplated and is being practiced in department of anatomy, with good results. This approach will be helpful for the orthopaedic and neurosurgery residents. For forensic study blood haematoma is easily seen and spinal cord injury can be assessed.

### Materials and Method:

After obtaining ethical clearance, the 05 adult cadaver of Maharashtra region were successfully embalmed and these embalmed cadavers were used for this study. The work done in a Medical College, Pune, Maharashtra. Instrument used for this dissection were toothed & untoothed forceps, scissors, scalpel, chisel, hand saw, hammer, periosteum elevator, long bladed knife, retractor, bone nibbler, bone cutter and electric saw. In this study, the approach followed is a combination of the classical approaches for removal of brain and spinal cord with an addition involving the removal of the remains of the squamous part of the occipital bone left over after the removal of skull cap by a circumferential cut and posterior laminectomy of all vertebrae. On the dissection table, before starting the dissection, the cadaver selected was

laid in prone position. The obvious long paramedian skin incisions are given from occipital bone and it continued down up to the coccyx with dissection of paravertebral muscle and soft tissue laterally and bilateral laminectomy is done with a bone nibbler interspinous and supraspinous ligaments are cut. This exposes the spinal cord within the meninges with the roots of spinal nerves and caudally the cauda equina in vertebral canal. The roots of spinal nerves and cauda equina are cut which freed the spinal cord within vertebral canal enabling their removal (Fig 2).

After that the head was cleanly shaved and with skin pencil a circular mark was drawn anteriorly 2 cm above the margin of the orbit, laterally above the auricle and posteriorly 1 cm above the occiput as routine method of removal of brain. By a sharp long blade knife along the marked line the scalp en masse is freed from the skull cap. The avulsed scalp is made to hang by pedicle at the root of the nose. Next a circular saw cut is given across the skull, keeping the cutting edge of the saw on the top of the skin edge surrounding the lower part of the head, thus a little more than vault of skull is removed leaving the endosteal layer of dura and venous sinuses with the brain. In the next step of removal of brain with meninges by lifting the basal aspect of the frontal lobe, rootlets of olfactory nerves are cut. After separating the dural attachments from the posterior margin of lesser wing of sphenoid bone, the optic nerve is approached and cut closed to their exit from the optic canals. Next the third and fourth cranial nerves are cut at their points of entry into cavernous sinus, after that tentorium cerebelli is cut along the superior border of the petrous part of temporal bone results in exposure of

cerebellum, which conceals the ventrally lying pons and medulla oblongata. On the inferior surface of brain 5th, 6th, 7th and 8th cranial nerves are identified and cut. After identification, the lower cranial nerves are carefully dissected out. Two oblique incisions are given from the cut margin of squamous part of the occipital bone and extend up to posterior arch of atlas. Posterior nuchal muscles are removed as well as squamous part of occipital bone is nibbled and removed in piece meal. With the meninges posterior aspect of brain is clearly exposed and removed along with spinal cord, spinal nerve roots and cauda equina (Fig 1). This specimen is mounted vertically in jar and kept in museum, used for academic purpose (Fig.3).



**Figure 1:** Intact brain and spinal cord with cauda equina with its meninges and nerve roots.



**Figure 2:** In situ visualization of spinal cord with its meninges and nerve roots in vertebral canal.



**Figure 3:** Brain and Spinal cord with its meninges and nerve roots mounted vertically in jar and kept in museum.

#### Discussion:

Brain is severed from the spinal cord by a cut through the lower part of medulla is classical method of removal. In the newer approach the intact removal of brain, brain stem, the spinal cord, the meninges, the nerve roots along with the cauda equina is accomplished with some extra efforts. This method of dissection holds out a great promise for viewing the spinal cord within its meninges as it lies within the vertebral canal.

The whole brain plus spinal cord removed may be kept as a museum specimen or it can also be used for teaching & research purpose. The posterior Laminectomy done in this method is the basic operative procedure for spinal decompressive neurosurgery (1), (2). For forensic study (3) collection of blood hematoma is easily seen whether it is extradural or subdural and spinal cord injury and fault of operation (medico-legal) can be assessed. In the brain, brain stem, spinal cord and canal space occupying lesion are better observed.

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