



## “Evaluation of Different Techniques of Extraction and Cleaning of Bones from Human Cadavers”

### Anatomy

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### ABSTRACT

**Background:** The present study was carried out to evaluate the different techniques for extraction and cleaning of bone specimen from human cadavers.

**Material and methods:** Skull, long bones, and other bones from embalmed preserved cadaver were obtained and cleaned. In present study, we applied 4 different methods for preparing the bone specimen.

**Results:** In present study, we observed that boiling followed by burial of embalmed specimen is ideal procedure for extracting bone specimen of skull and long bones.

**Conclusions:** Preparation of bone specimen from embalmed cadaver is a time saving technique for many medical institutions and self-prepared specimens are of good quality.

### KEYWORDS:

Bones, Extraction, Cleaning, Embalmed, Cadaver.

### Introduction

Teaching of anatomy to medical students is a challenging task for anatomists. Study of Osteology is very important to understand anatomy and its application in the surgical and orthopaedic practices. Bones are integral part of curriculum of medical students.<sup>1</sup> Study of osteology is very important for anatomist and also for clinicians and Forensic experts. There are various methods to procure bones for teaching purpose. In most of the medical institutes, there is gross shortage of human cadavers. A previous study revealed that in 90.90% of medical colleges of India, there was a gross shortage of cadavers.<sup>2</sup> Body donation is not a common practice in countries like India and it leads to shortage of human cadavers. There are some institutes who have started teaching anatomy in plastic replica.<sup>3</sup> But these are not ideal artificial substitutes and it lacks the range of variations found in real bones.<sup>4</sup> Normal anatomical patterns are not present in every bone as described in most of the standard textbooks of Anatomy; but these different patterns are not abnormal. These different patterns are variants which may be present in many human beings.<sup>5</sup> Traditional methods of extracting bones from human cadavers are time consuming and it also does not fulfil the requirement of bones. These are the prime factors responsible for evaluating different methods to procure bones from human cadavers. We conducted the present study with the aim to evaluate the least time consuming and practical method to procure bones from embalmed cadavers and wet specimen in the department of anatomy.

### Materials and Methods:

Present study was conducted by Department of Anatomy, TSM Medical College & Hospital, Lucknow, UP, India. In present study we used four sets of dissected specimens and each set was having a skull, a scapula, a humerus, a radius, an ulna, a femur, a tibia and a fibula. All the cadavers were received in the department as a kind donation for academic purposes. We performed different method for cleaning & processing bones on each set. Universal precautions were applied to prevent any mean of chemical and physical injury to persons involved.

**Method I:** The specimens were placed in metal container and were completely immersed in water. These specimens were boiled for 8-10 hours on gas stove.

**Method II:** Soft tissues were removed from the specimens with the help of dissecting instruments. Partially cleaned bones were immersed in 20 litres warm water containing 50 grams detergent powder.

**Method III:** Soft tissues were removed and partially cleaned bones were immersed in 20 litres of warm water for 24 hours and temperature

was maintained at 65°C..

**Method IV:** Bones were cleaned as described in first method and these bones were buried under soil. This procedure was done in humid weather (rainy season). After a period of 90 days, bones were excavated and rinsed under running tap water to remove the debris with soft brush.

Bones extracted from these methods were kept in acetone solution for degreasing and after that we placed all bones in hydrogen peroxide (6%) solution for whitening the bones.<sup>6</sup>

### Results: Results of present study is tabulated in the table.

Method 1	Method 2	Method 3	Method 4
Cleaning: Greater extent in long bones Drawback: Remains of soft tissue at the ends of the long bones and skull especially around foramina	Cleaning: Effective in long bones Drawback: Small bones of skull became brittle	Cleaning: Not effective on long bones and skull Drawback: Partially cleaned long bones	Cleaning: Effective in long bones and skull Drawback: None

### Discussion

Dry human bone specimens are an important material for not only teaching anatomy to medical students but also for different surgical procedures.<sup>7</sup> There are various methods that decomposes the soft tissue and these are: i) boiling ii) use of chemicals iii) use of insects' iv) water decomposition and v) decomposition by burying in the soil. All these methods lead to complete skeletonization, and except boiling all other methods are effective for medium sized and large animals.<sup>8</sup> In present study, we observed that boiling of embalmed specimen followed by burying under soil has given best results for procuring good quality bones. This was in accordance to previous study done by Modi et al. <sup>8</sup> A previous study revealed that burying of human cadaver specimens in superficial surface of soil leads to early decomposition.<sup>9</sup> Humid weather of rainy season accelerates decomposition and leads to early skeletonization of specimen/cadaver.<sup>8</sup> Generally, decomposition of one week in the air is equivalent to two weeks in water and eight weeks in soil.<sup>7</sup> The time taken by method in present study was 90 days in comparison to one year by burying the cadaver without embalming, while embalmed cadaver may take little longer. Standard reported methods for extracting bones from the human cadavers are either boiling or burial. Formalin delays the decomposition of soft tissue in embalmed bodies. Boiling before burial of specimens leads to rapid decomposition of soft tissue as it decreases the content of formalin. We observed in present study that Method II was quite easy and less time consuming method for extracting the long bones from human

cadavers. Usage of acid for removal of soft tissue from bones also removes the calcium from bones and makes them brittle.<sup>9</sup> The chemical nature of bleaching powder resulted in cleaning and whitening the bones. The hydrogen peroxide resulted in speedy decomposition of adhered soft tissues and also added to the bleaching action.<sup>10</sup> It has also been proved that there is no effect on mechanical properties of bone after storage even if it has been procured from an embalmed specimen. However, a previous study revealed that embalming induces significant modifications of the molecular composition of bone.<sup>11</sup> Prepared bone specimens were having no decay or fracture and were intact with all normal features.

### Conclusion:

Preparation of bone specimen from embalmed cadaver can be of immense value for medical institutes having limited resources and manpower.

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