VOLUME - 10, ISSUE - 03, MARCH - 2021 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Medical Science

PROCUREMENT OF BONES FROM CADAVERS: NEED OF THE TIME FOR LEARNING ANATOMY.

DR Preeti Sonje * Professor, Dr D.Y.Patil Medical College Hospital and Research Centre, Dr. D.Y. Patil Vidyapeeth, Pimpri, Pune, Maharashtra, India. *Corresponding Author

DR P.Vatsalaswamy Professor and Director of Academics, Dr D.Y.Patil Medical College Hospital and Research Centre, Dr. D.Y. Patil vidyapeeth, pimpri, pune, maharashtra, India.

ABSTRACT As Osteology is important part of study of Anatomy, adequate and good quality bone sets are required in any department of Anatomy for both teaching purposes as well as for catering to the students demands. This leads to a perpetual drain on the department's repository of bone sets. Bone sets are available for sale but are quite expensive and original bones are not that easily available now a days. Considering the fact that every year a variable number of cadavers are being dissected by I[st] MBBS students, the shortage seems ironical. The bones recovered from cadavers are adequate to meet the demand but for the fact that they are unfit for use as majority of them are discolored or dark apart from showing soft tissue strands and greasy ends. With the aims and objective to provide quality bones to students, the bones were treated chemically so that they can be issued to students. The procedure by which cadaveric bones are retrieved is presented and discussed. To get quality bones that are satisfying for instructive value, aesthetically clean and reasonable durable, efforts have been made in the past by a number of workers, Edwards and Edwards 1959[1] and Ludwig 1979 [2]

KEYWORDS : Cadaveric Bones, Antiformin, NaOH.

INTRODUCTION-

Anatomy is the foundation of medical education. Teaching anatomy is a challenging task. Osteology or study of bones is very essential and integral part of anatomy curriculum . Human bones are unsurpassed in the ability to provide three-dimensional instruction in osteology. Also bones assist in understanding the attachments of soft tissue and the.course of neurovascular structures in the specific region. Unless and until students have actual bones , osteology cannot be learned most efficiently .Retrival of bones mainly involve soft tissue removal, bone bleaching, bone articulation and labelling. There are different techniques used in bone retrieval from the cadavers.Solutions of organic and inorganic chemicals are used to remove soft tissue from bones.Inorganic chemicals used are antiformin, ammonium hydroxide, sodium hydroxide and other alkaline solutions. Maceration with organic chemicals can be performed with enzymes such as papain or pepsin or with washing powders containing enzymes as well as burying in soil. Getting Original human bones now a days has become difficult due to government policy of not licensing any vendor to deal in human bones. Artificial bones which are made of plaster-of-paris or resins are available in the market but they are not good in terms of details of the morphological features of the original bones. We have tried different methods to standardize the perfect method of bone retrival[3].

Adequate and good quality bone sets are required in any department of Anatomy for both teaching purposes as well as for catering to the students demand. This leads to a perpetual drain on the department's repository of bone sets. Bone sets are available for sale but are quite expensive and not that easily available.

Considering the fact that every year available number of cadavers is being dissected by I[st]MBBS students, the shortage seems ironical. The bones recovered from cadavers are adequate to meet the demand but for the fact that they are unfit for use as majority of them are discolored or dark apart from showing soft tissue strands and greasy ends. With the aims and objectives to provide quality bones to students, the bones were treated chemically so that they can be issued to students.

To get quality bones that are satisfying for instructive value, aesthetically clean and reasonable efforts have been made in the past by a number of workers.

AIM AND OBJECTIVES

The cost of human skeleton is gradually increasing and is beyond the reach of student. Bones from formalinised cadavers are not of good quality and so far were not used for teaching purposes. By chemically treating these bones systematically, the quality can be improved reasonably so that the same can be issued to the students. Over the year, the department would develop a substantial repository.

MATERIALS AND METHODS

Materials required are
1) Antiformin stock solution prepared by
a) 10% sodium Hypochlorite 1400ml
b) Distilled water 1400ml
c) Potassium Hydroxide (45% wt/ wt) 4200ml 7000ml
2) Hydrogen Peroxide 50% & 3%
3) Ether
4) Sodium Hydroxide 0.5 & 1N (40g by wt NaOH in 1litre water)
5) Bones – Humerus , Radius & Ulna

The bones that were tried wear Humerus , Radius Ulna . About 15-20 bones of same type can be tried at a time by putting them in an enamel tray.

I -These bones were exhumed after variable period of burial but definitely after 3 months. These bones are washed in water first. The bones were dark because of formalin that is injected for preservation. The various methods that were tried on the macerated bones.

1. Treating them in 50% H2O2 for 48 hr.
2. Treating them with only 3% H2O2 at 70 C for 24hr.
3. Treating them with 3% Antiformin solution which is preserved from the stock solution as given above and then with 3% H2O2 and ether for about 24-48 hr (in each solution)
4. Treating these macerated bones with 0.5N NaOH for 24-48 hr.
5. Treating them in 1N NaOH for 48hr. in an incubator. Then putting in 3% Hydrogen Peroxide 70^{0}C for 24hr.

II. The next method was tried on bones from the parts dissected by students which were no buried.

1. Soft issue was not scraped at all and I was treated with

1. 0.5N NaOH at 700C in an incubator for 24-48 Hr.
2. 3% H2O2 at 700C for 24-48 Hr.
3. Ether for 24-48 Hr. putting them in an airtight jar

2. The bones were scraped completely of the soft tissue with a scalpel and glass pieces and the same methods as in " II. 1" above were tried.
3. The bones were scraped completely of the soft tissue with a scalpel and glass pieces and instead of 0.5 N, 1N NaOH was used and bones were treated with 3% H2O2 at 700C for 24-48 hr. and Ether for 24-48 hr.

III. One set of bones were kept as control for each method.
(Precaution : The bones were not handled with hand . Forceps were used while taking out the bones from NaOH as it is caustic & causes burns)

RESULTS AND OBSERVATIONS

I. One set of bones as control
I.1. The first method was not encouraging as the bones remained dark.
I.2. No change in colour after putting only in 3% H_2O_2 at 70^{0}C
I.3. The bones with this antiformin treatment turn out better.
I.4. This method gives good result but bones got softened and shafts got cracked .
I.5. The bones with this procedure turned out better but turned yellow after drying and were sticky / oily.

II. One set of bones as control.
II.1.This method when tried
(a) Bones turned out better
(b) Soft tissue remained at tubercles

II.2. By trying out the above method after scraping of the soft tissue and bones kept in a tray.
(a) Soft tissue got dissolved but not completely.
(b) Bones soft at some places .
(c) Bones turned white

II. 3. With this method
(a) Soft tissue completely dissolved.
(b) Bones were not soft at all.
(c) Bones turned white

Table No 1-I.-Control set

SR. NO.	PROCEDURE	OBSERVATION	RESULT
I.1	50% H2O2 FOR 48hr.	Remained dark	Not encouraging
I.2	3% H2O2 at 70oC for 24hr	Remained dark	Not encouraging
I.3	Antiformin solution &3% H2O2 & Ether	Better but not white	Not satisfactory
I.4	0.5N NaOH for 24-48hr.	Good but bones became Soft & shaft got cracked	Not satisfactory
I.5.	1N NaOH for 48 Hr. at 70oC & 3% H2O2 at 70oC for 24hr	Better but turned yellow after drying & were sticky/Oily	Not satisfactory

Table No 2-I I-Control set

SR.NO.	PROCEDURE	OBSERVATION	RESULT
II.1.	0.5N NaOH at 70% for 24-48hr. 3% H2O2 70oC for 24-48Hr.Ether at 70oC 24-48hr.	better , but soft tissue remained	Not satisfactory
II.2	0.5N NaOH at 700C for 24-48hr: 3% H2O2 700C for 24-48 Hr.Ether At 700C 24-48 hr. Off all possible tissue	better, but soft tissues remained at some places. Bone remained soft at some places	Not satisfactory
II.3.	As in II.2 but using 1N NaOH Instead of 0.5 N NaOH	Best Soft tissue Satisfactory Satisfactory Bones not soft.	Satisfactory

DISCUSSION

It is observed that with the first 3 methods i.e.'I.1', 'I.2', 'I.3' the results were not encouraging as the bones remained dark due to the formalin injected earlier . When 0.5 N NaOH was used in method "I.4" the bones became white but turned soft and the shaft got cracked. When 1N NaOH was used in method 'I.5'. the bones turned white but after drying turned yellow and were oily/ sticky due to the presences of glue/gelatin.

When 1N NaOH was used in method 'II.1'the bones turned out better ,but soft tissue remained at tubercles because soft tissue was not scraped out completely . When the bones were scraped of the soft tissue and bones kept in a tray in method 'II.2' soft tissue was not dissolved completely as 0.5N NaOH was used , bones soft at some places only but bones turned white . Lastly when 1N NaOH , 3% H_2O_2 at 70^{0}C & Ether were used after scraping the soft tissues completely in method 'II.3' the bones turned white,bones were not soft at all and soft tissue completely dissolved. By treating with 1N NaOH soft tissue was removed from the bones. After being treated with 3% H_2O_2 (Bleaching action) the bones were white in colour and Ether removed the glue/gelatin.

SUMMARY

Since the cost of human skeleton is gradually increasing efforts were made to retrieve bones from the dissected parts. With this aim, different method were tried to retrieve bones from formalinised cadavers. Treating these bones, after scraping the soft tissues with 1N NaOH at 70^{0}C for 24hr. and later with 3% H_2O_2 for 24-48 hr. and then with Ether for 24-48 hr. yielded good bones suitable for teaching purpose. By this method the department would have a good and substantial repository of bones and need not purchase them.

REFERENCES

1. Edwards JJ,Edwards MJ ; Medical Museum Technology, London, Oxford University press 1959 ,Pp 122-125.
2. Jurgen Ludwig; Current mrthods of Autopsy practice, W.B.Saunders Company, Philadelphia 1979,Pp 134-136.
3. J P Bender Cadaver Bones Used to Mend Living.South florida business journal:Jan 15 2001.
4. Modi B.S, Puri N and Patnaik V.V.G (2014). Evaluation of techniques for cleaning embalmed cadaverss bones. International Journal of Anatomy and Research, 2 (4); 810-813.
5. Ator, G.A, Andrews, J.C and Maxwell, D.S (1993). Preparation of the human skull for skull base anatomic study. Skull base surgery, 3(1), 1-6.
6. Boyle, C (2010). Maceration and preparation of mammal skeleton for long-term curation. University of Indianapolis: Archaeology and Forensic Laboratory.
7. Eriksen A.M, Simonsen K.P. and Rasmussen A.R (2013). Conservation of mitochondrial DNA in fast enzyme-macerated skeletal material, International Journal of Conservation Science, 4 (2); 127-132
8. Offele, D, Harbeck, M, Dobberstein, R.C, von Wurmb-Schwark, N and Ritz-Timme,S (2007). Soft tissue removal by maceration and feeding of Dermestes sp.: impact on .morphological and biomolecular analyses of dental tissues in forensic medicine.International Journal of Legal Medicine, 121 (5), 341 - 8.
9. Christensen, A.M and Myers, S.W (2011). Macroscopic observations of the effects of varying fresh water pH on bone. Journal of forensic sciences, 56(2), 475-9.
10. Backwell, L.R. Parkinson, A.H, Roberts. Criteria for identifying bone modification by termites in the fossil record. Palaeogeography, Palaeoclimatology,Palaeoecology, 337-338, 72-87, 3(1), 1-6.
11. Mairs, S, Swift, B and Rutty, G.N (2004). Detergent: an alternative approach to traditional bone cleaning methods for forensic practice. The American Journal of Forensic Medicine and Pathology, 25(4), 276-84.