

Buried dead bodies do communicate truth: A Four-year exhumation-based studyMahesh G¹, Sudhakar S²¹Associate Professor, Department of Forensic Medicine, Government Medical College, Anantapuramu Andhra Pradesh, India²Assistant Professor, Department of Forensic Medicine, Government Medical College (RIMS), Kadapa, Andhra Pradesh, India

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Abstract

Background: The word exhumation is defined as excavating out of a buried dead body. The indication of the process of exhumation is to determine the identity of the deceased or to elucidate the cause of death or both especially when there is conflict before the law. Aims and Objectives: The purpose of the study is to know how feasible is to establish the cause of death in exhumed bodies in relation to time of burial and positive opinion regarding the cause of death in addition to other related issues. Material and Methods: The presented study was conducted over a period of 3 and half years from January 2003 to January 2006 at Gandhi Medical College, Secunderabad and include a total of 34 cases were studied. Standard methods were used for recording as well as analysis of data. Observations and inference: cause of death could be established in about 60% of exhumed bodies and opinion could not be elicited out in eleven cases. Head injury amounted to the topmost cause of death with 8 (24%) followed by asphyxia with 4(12%). Conclusion: The cause of death could be arrived at exhumation with a reasonable degree of accuracy in the early burial periods and the feasibility as to assessing cause of death will gradually decrease with increase in time since burial. It is suggested to deduce and follow standard protocol and procedures are required to increase the chances of establishing cause of death at exhumation.

Keywords: Buried dead bodies, Cause of Death, Exhumation, Head injury, Homicide, Poly-trauma.**Introduction**

The term Exhumation means, ex - Out of, Humus - ground, Exhume -To bring into light, especially after a period of obscurity or Burial¹. It is legal digging out of an already buried body from the grave². This term is used alternatively along with the word 'disinterment', that means excavating a buried body out of grave for medico-legal purpose^{3,4}. As a part of forensic anthropology, the systematic exhumation of mass graves is becoming a frequent occurrence globally⁵. In most of the exhumations it is either identity of the dead or the cause of death which is contradicted before the law, and law requires reexamination of the body to prove or disprove the matter in question to provide justice to the deceased.

It is almost obscure to determine the cause of death at exhumation as the time factor plays a pivotal role as the evidence as to cause of death will slowly get masked off/vanishes as the putrefaction process advances. The current study on exhumation is predominantly aimed to assess how far or in how many cases cause of death can be determined and if possible, to deduce a co-relation between the positive determination of cause of death and time elapsed since burial be established.

Materials and Methods

The presented study was carried out at Department of Forensic Medicine, Gandhi Medical College, Secunderabad from July 2003 to January 2006 after obtaining clearance from institutional ethics committee. A total of 34 cases were conducted during study period of which 6 cases were done in 2003, 12 cases in the year 2004, 13 cases in the year of 2005, and 3 cases were done up to January 2006. The study encompassed 22 males and 11 females exhumed dead bodies and one case where sex could not be

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ascertained. The data obtained from the study was recorded in a pretested proforma and was analyzed using appropriate statistical methods.

Observations and Discussion

Age and sex wise determination of cases: On perusal of **table no 1**, out of 34 cases 65% (22) belongs to male sex, 32% (11) belongs to female. In one case the sex could not be ascertained, as it is a case of fetus. As only few fetal bones are available at the exhumation, the medical officer has not made any attempts to

ascertain the sex from other techniques available. It is to be understood that the male sex is prone for violent traumata, it is natural for the increasing incidents number of male dead bodies in exhumations also. The female incidents are mostly confined to natural deaths or suicidal cases where allegations of harassment have been made. The allegations of homicide are rare in female deaths and in 2 cases where these allegations are made connected with extra marital relationships.

Table No.1: Age and sex wise distribution of cases

AGE (in years)/ SEX	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Male	2	3	3	5	4	3	2
Female	1	2	3	2	3	0	0
Undetermined	1	0	0	0	0	0	0

Marital status and distribution of cases: Observations of **table no 2**, indicate that in 10 (24%) cases out of 34 cases the deceased were unmarried, and below 20years with only 2 cases in third decade in the life. In most of the cases in this group the deaths are suicidal in the form of hanging or poisoning or

accidental deaths. One can expect more deaths related to sex from this group. But the actual situation is quite different with not a sex related death. In married group (23 cases, 68%) preponderance of accidental or homicidal deaths over suicidal deaths is more common (contrasting feature with unmarried group).

Table No.2: Distribution of cases in relation of manner of death and marital status

Marital status	Cases	Manner of death			
		Accident	Suicide	Homicide	Undetermined
Married	23	8	2	6	7
Unmarried	10	1	2	2	5
Not Known	1	0	0	0	1

Distribution of cases according to type of grave: Table No.3 below points out that about 76% of graves (26 graves) are of earthen type, 15% of (5 graves) pukka type of graves, and about 8% of graves (3 graves) bugili type. The pukka types of graves are all located in notified graveyards. The high incidence of

earthen graves can be correlated with socio economic state of deceased as well as the under takers. In addition, the assailant indulging in a secret disposal never put a permanent structure, which enhances easy spotting by passersby.

Table No.3: Distribution of cases according to type of grave

Type of Grave	Cases	With Coffin	Without coffin
Earthen	26	3	23
Pucca	5	1	4
Bugili	3	0	3

Depth of grave and legal state of burial: Table No.4 reiterates that in 95% of lawful burials are in notified areas and family gave yards. The bodies were buried at a depth of 3 to 5 feet from ground level with maximum incidence at 4 feet. Whereas unlawful burials and

secret disposals the depth is 1 to 3 feet from the ground level. The depth is an important parameter regarding the nature of the case apart from its influence on the state of the buried body. This in turn influence the outcome of the effort executed by the medical officer.

Table No.4 Depth of grave and legal state of burial

Depth of Grave	No. of Cases	Legal status of burial	
		Lawful	Unlawful
Up to 1feet	3	0	3
Up to 2feet	5	1	4
Up to 3feet	9	5	4
Up to 4feet	15	14	1
Up to 5feet	2	2	0

Distribution of cases as per direction of head in the grave: shows that all the burials in regular and family graveyards are showing the head of the cadaver in south direction only. Whereas burials in non-notified areas (unlawful burials) the head direction is in a direction other than south. In unlawful burials particularly in remote areas, as the undertakers are in a

hurry to dispose the body unnoticed, the simply dump the body into the pit without caring for the direction of the head inside the pit. Hence dead bodies found in an unusual direction of head always almost indicate that it is a secret disposal with rapid execution raising the suspicion of a foul play.

Table No.5: Distribution of cases as to direction of head in grave

Head Position	Cases	Lawful burial		Unlawful burial	
		Non-Muslim	Muslim	Non-Muslim	Muslim
Towards South	26	22	1	3	0
Other than South	8	0	0	8	0

Exhumation vis a vis time since burial: It is evident from **Table No.6** that in 33% of cases out of a total 34 cases were exhumed within one week from the date of burial and 20% of cases within 1 month. Hence altogether in over 50% of cases exhumations were carried out within 1 month from the date of burial. In another 33% of cases the exhumations are carried out between 1 to 6 months after burial, the rests of cases

are exhumed either after 6 months or undetermined. Time since burial from the date of exhumation is an important factor as it influences the chances of predicting time since death, cause of death as it is directly related to the decomposition process. Similar opinions were quoted in a study conducted by Mann etal⁶.

Table No.6: Exhumation in relation to time since burial

Time since burial	No. of Cases	Percentage (%)
Up to week	12	35.3
1 week to 1month	7	20.6

2months	6	17.6
3months	3	8.82
5months	1	2.95
Above six months	4	11.77
Undetermined	1	2.95

State of bodies at exhumation: Table no. 7 shows that out of 34 cases, the dead bodies were in a state of moderate to advanced putrefaction in 17(50%) of cases, skeletonization of the dead body was evident in about 3 (9%), and mummification and adipocere formation was evident in one case each. In the rest of the 35% cases, combinations of postmortem changes were present such as putrefaction with mummified extremities, putrefaction with adipocere formation over

fatty areas or mummification with skeletonization. Formation of adipocere increases the chance of prediction of cause of death as it preserves the features of injury and internal viscera. However sometimes it provides erroneous information as to time since death as its time taken for its formation is not quite stable and depends on several factors. A case of adipocere formation within 3 days has been reported by Mohan Kumar T.S. etal⁷.

Table No.7: State of dead body at exhumation

State of dead body	No. of Cases	Percentage (%)
Putrefaction	17	48.6
Mummification	1	2.95
Adipocere	1	2.95
Skeletonization	3	8.82
Mixed Changes	12	35.29

Exhumed dead bodies and types of Injuries found:

It is observed from Table No.8 that injuries were found in about 19 cases amounting to 55.89% of total 34 cases of which soft tissue injuries were present in 11(32.35%) cases, skeletal injuries in 3(8.83%) of cases and both skeletal and soft tissue injuries were present in 14.70% of cases. Of these injuries contusions were the commonest type of injury found over the exhumed cadavers which were followed by abrasions and lacerations. This finding indicates that the contusions are preserved for a long time over soft

tissues comparatively while skeletal injuries provide evidence as to cause of death for a long time. In the current study involving 34 cases, soft tissue injuries predominated the picture than skeletal injuries. In a study conducted by Łukasz Szleszkowsk et al⁸ indicated that cause of death could be opined even after sixty years in causes where the death of the deceased is ensued because of a skeletal injury. We are also of the opinion that the skeletal injuries form an important data for fixing up cause of death in exhumed bodies.

Table No.8: Exhumed dead bodies and types of injuries found

Injuries	Number of Cases	Percentage (%)
Soft Tissue	11	32.35
Skeletal	3	8.83
Both	5	14.70
No Injuries	15	44.11

Visibility of soft tissue injury vis a vis time since burial: the soft tissue injuries were well visualized up to one week in the bodies exhumed within one week. The visibility of soft tissue injuries gradually decreased with increase in time since burial as indicated in **Table No.9**. This is probably because of advancement of putrefaction and gradual vanishing of the soft tissues

over the dead bodies with prolongation of time interval. It can be inferred that the visibility of injuries will be better in the bodies that are exhumed earlier than the bodies that are exhumed after longer periods of burial. These findings go against a study conducted by Breitmeirer D etal⁹.

Table No.9: Time interval since burial versus number of soft tissue injuries

Time Interval	No. of Soft Tissue Injuries
One Week	9
One Week to Month	5
Two months	2
More than two months	0

Exhumation and positive opinion as to cause of death: On perusal of **Table No.10**, it is evident that out of 34 cases, exhumed during the 2003 to 2006 period, in 23 cases amounting to about 67.65%, the cause of death was established after exhumation. In 9 cases (26.47%) no opinion was arrived at exhumation and 2 cases were pending for want chemical analysis report from Forensic Science laboratory. The success rate

amounting to about 70% in establishing the cause of death speaks itself the value of exhumation in the given circumstances of advanced decomposition. Similar findings were noticed in a study conducted by Karger B et al¹⁰. On the other hand, the comparative high incidence amounting to about 30%, where the exhumations yielded no result as to cause of death is also a matter of concern, but for the lack of corroborative evidence and advanced putrefaction in these cases.

Table No.10: Exhumation and opinion as to cause of death

Opinion as to Cause of death	Number of cases	Percentage (%)
Positive opinion	23	67.65
No opinion	09	26.47
Opinion Pending	02	5.88

Cause of death established at Exhumation: **Table No.11** points out that head injury was the commonest cause of death as identified in 23.52% of cases followed by poly trauma and asphyxia in about 12 % each of total cases. The other less common causes included electrocution, firearm injuries, lightning in 1% cases each and poisoning followed by natural diseases in 2% cases each.

neither helpful in confirmation nor to contradict the allegations made. Hence it can be inferred that exhumations have negative value rather than a positive value from Medico Legal point of view, because they can help to confirm with the suspicion but not to contradict the suspicion. In a study conducted by Wolfgang Grellner and Frank Glenewinkel¹¹, it is opined that the cause of death could be clarified with sufficient certainty in 78% of cases in their study is almost similar to the results observed in the current study.

In two cases, out of nine cases where opinion as to cause of death was not opined, wherein allegation of Homicide was made, the exhumation findings were

Table No.11: Final Opinion as to Cause of Death

Cause of Death	Total Number of cases	Percentage (%)
Head Injuries	8	23.52
Polytrauma	4	11.77
Asphyxial Deaths	4	11.77
Fire Arm Deaths	1	2.95
Electrocution	1	2.95
Lightening	1	2.95
Poisoning	2	5.88
Diseases	2	5.88
No Opinion	9	26.47
Pending	2	5.88

Exhumation and requirement of lab investigations:

Analysis of **Table no.12** indicate that in 14 cases (41.18%), the final opinion regarding the cause of death was given directly from the corporal findings immediately after exhumation, without any chemical, histological or laboratory investigations. A total number of 6(17.65%) cases demanded support of lab investigation for arriving at cause of death and only provisional diagnosis was expressed at exhumation. In another 6 cases, no opinion could be expressed regarding the cause of death immediately after exhumation. Conclusion as to cause of death could not be arrived in six cases even after arrival of lab investigations. These findings indicate that in majority of cases (42%) of the cases opinion as to cause of death was arrived straight away based on the lesions/injuries

that were present over the exhumed dead bodies because the corporal evidence corroborated with history provided before investigation and hence procedural aspects and formulations prescribed for exhumation were not followed. However, it is strongly recommended that the procedural formulations are to be strictly implemented in all cases of exhumation specially in cases where lesions are minimal and compatible with life or if there are no lesions. In other words, the theory of exclusion must be applied before concluding. A study conducted by Raffaella Bianucci et al¹² demonstrated that plague bacilli could be detected from bone fragments belonging to 16th century obtained by exhumation by using rapid diagnostic kits indicate the importance of laboratory investigations in establishing cause of death in exhumed dead bodies.

Table No.12: Opinion as to cause of death and supportive investigations

Final opinion as to cause of death	Total Number of cases	Percentage (%)
Final Opinion with out Laboratory Investigations, etc.	14	41.18
No Opinion with out Laboratory Investigations, etc.	06	17.65
Provisional Opinion with Laboratory Investigations, etc.	06	17.65

No Opinion with Laboratory Investigations, etc.	06	17.65
Pending	02	5.88

Conclusion and suggestions

From the observations and discussions, the following conclusions and suggestions were made out:

1. The commonest postmortem change that was observed during the study was putrefaction which is leading to skeletonizing. Decomposition changes like adipocere and mummification are rare and mostly dependent on the depth and nature of soil of the grave. Red soils are found to initiate putrefaction, whereas sandy soils are prone to initiate mummification in buried bodies.
2. The soft-tissue injuries over buried bodies can be made out as long as morphology of the region of body is maintained. Persistence of surface wounds and closed wounds like abrasions and contusions is longer when compared to open wounds like lacerations and cut wounds.
3. The skeletal injuries usually give a positive conclusion regarding the cause of death and negative conclusion regarding the manner of death, and it is vice versa in case of soft-tissue injuries.
4. Head injuries are leading cause of violent deaths in exhumed bodies followed by polytrauma and asphyxias. This clearly establishes the need for careful examination and search of soft tissues for signs of trauma compared to skeletal injuries, which prolong them selves.
5. Establishment of the disease process is a Herculean task in exhumations, as most of the diseased process is confirmed to soft tissue only. Once the body undergoes extensive putrefaction the chances of identification of disease process is difficult except for skeletal lesions.
6. Conclusion of no opinion should be made before exhausting all available means like application of laboratory services, because the guilt and innocence of a person solely rest on medical opinion, as there is no witnesses and evidence in these cases. It is suggested to

follow standard protocol and procedures are required to increase the chances of establishing cause of death at exhumation.

From the forensic pathologist point of view, an exhumation was nothing, but a case for establishment of identity and cause of death. However, the actual challenge lies beyond this if the corporal evidence is studied in a proper perspective to prove or disprove a matter in question by including the services of Forensic Science experts.

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