HUMAN SKELETAL COLLECTIONS: THE RESPONSIBILITIES OF PROJECT MANAGERS, PHYSICAL ANTHROPOLOGISTS, CONSERVATORS AND THE NEED FOR STANDARDIZED CONDITION ASSESSMENTS

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Abstract

This paper examines the need for the development of a collection care procedure for human skeletal collections. A standardized condition audit needs to be carried out on skeletal material shortly after excavation in order to assess any degradation of the bone due to problems with handling and storage conditions. Specific skeletal collections may be subject to a high level of access due to teaching and research. These collections in particular need to use a combination of access logs and a routine condition audit as part of a mitigation strategy to limit damage. The excavation, processing and curation of skeletal material in the UK are reviewed against current standards for conservation, project management and collections care.

Introduction

The principal goal of archaeological conservation is to minimize post-excavation decay of archaeological material in order to maximize the potential information accessible during examination and analysis in the laboratory. This is usually followed by long-term curation, which makes the material available for future research and re-evaluation. With excavated artifacts the relationship between excavators, conservators, curators and researchers is well defined. However, with the bulk of excavated human bone the intervention of trained conservators has been limited. This has often led to the development in isolation of protocols for cleaning, handling, packing and reconstruction of human skeletal material that do not follow best practice for the bulk of curated material. The general exceptions to this are single spectacular burials, with complex grave goods, or unusual preservation of the body (Watkins & Cameron 1987; Johansson 1987; Koob 1992). This paper focuses on excavated skeletal material from large assemblages within the operational and legislative framework in the UK and will review best practice for the management and documentation of human skeletal material from excavation through to deposition in collection. A case will be made for standardized condition assessment of human bone in order to monitor any deterioration of these collections caused by handling or inadequate storage conditions. This review is set against the current planning guidelines in the UK, with the emphasis on developer-funded excavation.

Potential Risks to Skeletal Collections

Skeletal material is at risk from damage throughout the excavation/ post excavation phases, specifically:

- Decay in the ground
- Breakage during excavation
- Poor packing and transport from site
- Damage during cleaning
- Damage in long-term storage (poor environmental controls)
- Damage due to poor handling techniques during study of collection (teaching/research).

The condition of bone in the ground has been the subject of extensive research (Millard 1998) and, to a large extent, *in situ* degradation will predicate the effects of poor recovery and post-excavation handling. The subsequent degradation of skeletal archive material has received comparably little attention. The bulk of the discussion of bone in the conservation literature is concentrated on artifacts made from animal bone and related material (Starling & Watkinson 1987; Watkinson & Neal 1998). It is widely accepted that in order to assess the success or failure of care procedures for stored museum artifacts, a well-documented condition report is needed as a baseline. The use of condition assessments is well established for most artifact groups within museum collections (Keene 1996). However, these principles have not been universally adopted for skeletal collection, especially those stored outside a formal museum. A recent study of the skeletal collections at Bradford (Caffell *et al* this volume) emphasized the problems of trying to use condition information from current skeletal recording forms to assess degradation due to handling and storage. The collections at Bradford are an extreme case because of the level of use in both teaching and research; however, these issues are relevant to all skeletal collections in medium to long-term curation.

Pressures on Osteological Collections

UK skeletal collections are housed in a range of institutions including museums, excavation units and universities. Resources to curate these collections vary considerably. The pressure on skeletal collections in the UK comes from the numbers of researchers and students who wish to have access to them. There are currently around 20 active researchers in human osteology in the UK, with a total of c.45 graduate students studying human remains in UK universities (figures for 1999-2000). Visiting scholars from abroad augment these numbers. Due to human skeletal variation, casts and plastic skeleton are no substitute for teaching, while research projects will require repeated access to specific collections by a number of students. In this respect human bone is different from other classes of material derived from excavation; a number of different scholars often study the human bone from an excavation, not just the physical anthropologist responsible for the initial academic report. Indeed, these collections *must* be available for research and teaching, despite the difficulties caused for collection managers, if we are to justify the retention of human-derived material in our excavation archives. Palaeopathological specimens frequently exhibit chronic signs of conditions that are now either rare, or will never be seen again. For these reasons

skeletal collections need closer scrutiny in terms of condition assessment and damage limitation. Ironically, skeletal material sees less formal collection care management than other less heavily used materials.

Management of Archaeological Projects

In response to the increasing complexity, scale and cost of archaeological projects English Heritage produced a formal procedure for the management of archaeological projects known colloquially as MAP 2 (English Heritage 1991).[1] This divides the project into a series of phases:

- Phase 1 - project planning
- Phase 2 - fieldwork
- Phase 3 - assessment of potential for analysis
- Phase 4 - analysis and report preparation
- Phase 5 - dissemination

Discussion of standards in the excavation and curation of skeletal material needs to be set against the detailed objectives of phases 3, 4 and 5.

In Phase 3 the freshly excavated material is assessed, "environmental specialists (i.e. physical anthropologists) should liaise closely with conservators during this stage to ensure that appropriate recommendations can be made on both immediate and long-term conservation requirements" (MAP 2 paragraph 6.11). During this phase a decision *can* be made not to proceed with further analysis, in which case the archive is immediately prepared for deposition. However, it is highly unlikely that any cemetery site with a substantial number of burials would be considered inappropriate for further study under the terms of MAP 2. Repackaging would normally be carried out at this phase to satisfy English Heritage and Museums and Galleries Commission (MGC) standards, and a condition assessment should be carried out (Museums and Galleries Commission 1992).

In Phase 4 the principle analysis of the skeletal material is undertaken by a physical anthropologist, and the research archive is assembled. This will include detailed recording of each individual skeleton. In this context skeletal collections are either processed with in-house expertise or sent out to specialist sub-contractors. The report text is prepared for publication.

In Phase 5 the final text of the excavation is submitted for publication. The excavation archive is deposited in a receiving museum or institution that will undertake the long-term curation of the material and the collation of the various specialist reports. MAP 2 (paragraph 4, 10) clearly states, "the site archive is a primary source and must be clearly stored so that it can be consulted in the future. The project manager should ensure that appropriate advice on the conservation needs is available to the project team. Long-term storage is a museum responsibility." The Museums and Galleries Commission set standards for deposition of the excavation archive (see below).

The Context of Current Archaeological Excavations in the UK

Due to development pressure, excavations of inhumation cemeteries are relatively commonplace with hundreds of bodies excavated each year by archaeologists in Britain. The bulk of this material dates from either the Roman or medieval periods. Although a number of notable post-medieval burial sites have been excavated (Molleson & Cox 1993), these can be more problematic and often involve non-archaeological intervention or reburial of the human remains without study or thorough analysis (Cox 1998). Currently in the UK there is little public criticism concerning disturbance of the dead by archaeologists and limited requirement for re-burial. Specific exceptions to this include a Jewish cemetery in York, where religious intervention enabled only limited recording *in situ* prior to reburial. In the UK a popular television program entitled 'Meet the Ancestors" focuses solely on the excavation and analysis of human remains and receives relatively little complaint from the public (pers. comm. Ian Potts, Meet the Ancestors, BBC). If reburial of excavated Christian burials from consecrated ground is required, there is often a very generous time limit. Any recommendations for best practice and condition recording must be realistic in terms of the volume of human remains that may be recovered from any one site. During 1994, six months of excavations at Hull Magistrates Court recovered 243 inhumation burials (pers. comm. J. Buglass, Humberside Archaeological Partnership, Hull). Excavations in London have produced very large numbers of burials. The Royal Mint site, for example, is a plague cemetery, which is estimated to have originally contained c.2400 bodies, of which only c.25% have been excavated (Hawkins, 1990,640). Current excavations at St. Mary Spital (London) have recovered over 7000 skeletons to date (see Barham & Lang, this volume).

In England and Wales the removal of bodies is covered by Section 25 of the Burial Act (1875)- *the regulation of the exhumation of human remains* (Garrett-Frost 1992). This requires a Home office license for the removal of the remains of any body from a place of burial except when removal is:

1. From one consecrated place to another under faculty, or license,
2. In accordance with the Disused Burial Grounds (Amendment) Act 1981 (section 2.7),
3. Under planning development legislation.

[1] English Heritage is a "super quango," formed in 1983. It is responsible for the curation of the archaeological resource, although the statutory responsibility for monuments remains with the respective Secretaries of State. Similar bodies exist for Wales, Scotland and Northern Ireland. With the introduction of new planning directives in 1990, which extended the "polluter pays" philosophy to archaeology, English Heritage has moved to a management and advisory role, while excavations are developer funded. With these changes excavation is conducted by contracting units operating by competitive tender. Quality control of the tendering process and excavation practice is provided at a regional level by archaeological curators (county archaeologists) usually based within local government planning departments. For further details, and variation of practice in Scotland, Wales and Northern Ireland see Hunter and Ralston (1993, 30-43).

The coroner must be notified of the discovery of human remains. In reality, provided the archaeologist can demonstrate that the remains in question are archaeological, there is little impediment to their removal. The Home Office license specifies either immediate reburial, study followed by reburial or long-term curation. Excavation on land controlled by the Church of England – which in reality controls most churches and graveyards of the medieval period that are still in use – requires a faculty (license) issued under ecclesiastical law (Bianco 1994: 91). These are drawn up with the aid of the relevant Diocesan Advisory Committee, which has archaeological advisors. The position is slightly different under Scots law (Historic Scotland 1997). In the UK, with current legislation and public opinion there is little impediment to the excavation of human remains buried before 1850. The bulk of these are either permanently curated or in medium term storage for study prior to eventual reburial. It is generally burials excavated under faculty that have specific conditions concerning the location of storage, access for study and time limits prior to reburial.

Current Excavation Practice for Skeletal Material

In the UK the bulk of burials are excavated and recorded by field archaeologists, usually with advice from trained physical anthropologists. For very large cemetery excavations personnel with training in human skeletal biology[2] may work on site, actively excavating material and carrying out preliminary recording *in situ*. This approach is certainly favored for small groups of highly degraded burials but is not practical for very large cemeteries. However, since the bulk of UK archaeology graduates have had no formal training in human skeletal anatomy it follows that most professional excavators lack formal training in excavating burials. Although general awareness of pertinent issues has improved in recent years there is clearly a need for more in service training or employment of trained personnel on cemetery excavations.

Working practices for archaeologists excavating human remains are provided by a number of manuals (e.g. Museum of London Archaeological Site Manual; McKinley & Roberts 1993). Most burials are excavated using small hand tools, usually a plasterers-leaf or small pointing trowel. Some field manuals and conservation literature recommend the use of plastic or wooden tools to prevent damage to soft bone surfaces (Sease 1987) although it is clear that this practice is not widely adopted. Prior to lifting any bones the burial is recorded using a combination of skeleton recording sheets, photography and sometimes a drawn plan. The plan, usually at scales of 1:10 or 1:5, is not universally adopted since it slows down the progress of excavation and is often inaccurate (Spence 1990). The practice of lifting and bagging skeletal element varies between archaeological contractors. Most follow the general recommendation that the bones should be bagged by skeletal area. In the past all the bones from a burial were often placed in a single plastic or paper bag without any packaging. This practice, which led to much damage and mixing of skeletal elements, is now rare. While most manuals agree that the bones of the axial skeleton and the upper and lower limbs should be placed in separate bags for the left and right sides (Museum of London Site Manual; McKinley & Roberts 1993: 5), practice varies when it comes to the skull and mandible. A number of authorities merely suggest that the skull and mandible should be bagged together and then placed in the same box as the rest of the skeleton. Others recommend a separate skull box. Angela Boyle (pers. comm. Oxford Archaeological Unit) is quite specific in her recommendations--under no circumstance should the skulls be transported from the site in plastic bags alone, but they should be placed in boxes packed with acid free tissue paper. More elaborate lifting methods are advised in the current conservation literature (Watkinson & Neal 1998: 79). "Whole skeletons should be lifted by a conservator or environmental specialist following detailed recording. To lift a robust skull, carefully excavate the earth from its exterior then cover it with two layers of aluminum foil. Remove the remaining soil from beneath it and lift it into a previously prepared container padded with polythene or polyether foam. Repack it more carefully indoors using crumpled acid free tissue but do not wrap it. Avoid consolidation as this could interfere with analytical techniques" (Watkinson & Neal 1998: 79).

In general the ethics of archaeological conservation are moving towards minimum intervention, and certainly limiting the amount and range of adhesives, consolidants etc. that are used because these are likely to compromise present or future analytical programs (Oudemans & Erhardt 1996; Paterakis 1996; Wilson 1996). While in practice this is useful for highly degraded elements, in reality these recommendations are over-elaborate and unrealistic for the bulk of material and so are rarely carried out by excavators who simply do not have the materials and specialist personnel available throughout the whole excavation. It is clear from the examination of freshly excavated material that there are fresh breaks, and missing skeletal elements that point to problems caused by excavation methods. The extent of these problems is determined by a combination of the quality of the excavation, time pressures and the condition of the bone at the point of excavation.

Once excavated, the bulk of skeletal material is cleaned using water and a soft toothbrush and allowed to air-dry (McKinley & Roberts 1993: 7). Recent excavations have used water-jets over a mesh, although health and safety concerns have been raised about aerosols and water-borne pathogens (H.Dodson, pers. comm., University of Bradford).. Once dry, all bone should be *legibly* marked with Indian ink, taking care to avoid breaks and joint

[2] In the UK physical/biological anthropology is usually taught within specialist post-graduate courses such as the MSc in Osteology, Paleopathology and Funerary Archaeology run jointly between Bradford and University of Sheffield. Most graduates of these courses style themselves Human Skeletal Biologists or Osteologists. The term Physical Anthropology is not often used in relation to archaeological remains.

surfaces. The importance of marking is emphasized by the mixing of curated skeletal elements in a recent survey (Caffell *et al.* this volume).

Packaging Skeletal Collections

Under current practice, two major causes of post-mortem damage to human bone are poor packaging and inappropriate handling. The published recommendations for packaging are flawed (McKinley & Roberts 1993: 7), containing no mention of the use of punch-holes in polythene bags or extra padding such as jiffy-foam and other precautions used with fragile artifacts such as metalwork (Watkinson & Neal 1998: 19). Clearly bone, unless it forms part of an artifact, has become a Cinderella material when it comes to advances in packaging. Packaging at excavation is only a temporary measure to safeguard the material from site to laboratory. When the material is processed (as soon as possible after excavation under MAP2 phase 3), archival packaging must be of the high standard governed by MGC guidance. All bone should be in appropriately sized boxes. Ideally the bulk of the skeleton should be in a single box, big enough to accommodate the long bones with ease. A good case can be made for a separate skull box, if this is in conjunction with appropriately padded with acid free-tissue. However, this refinement is rarely put into practice. It is clear that the bulk of human bone suffers from the use of generic packaging with a limited range of box sizes, and without the customized packing that has become the norm for most excavated materials. At Bradford a recommended protocol was developed for packing a skeleton into a single box (fig. 1). However, in light of our recent condition survey, it is clear that these recommendations are not always followed. It is clear that a revision of packaging practice is necessary.

Skeletal Records

In current practice there are two types of record. First, the excavator carries out the basic recording in the field. This is followed by detailed examination and recording by a physical anthropologist as part of the post-excavation process. Typical skeletal recording sheets used by field units have an outlined skeleton. The presence/absence of bones is colored in. In addition key words such as good, moderate, poor, decayed, are used to describe the general bone condition. The skeleton record sheets recommended for use on site by McKinley and Roberts (1993) are fine as a primary record. However this is not detailed enough to form the basis for long-term condition monitoring. The volume of skeletal material from most cemeteries, plus pressures of time and varied levels of anatomical experience of individual excavators dictates that detailed condition reports need to be compiled post excavation. In addition, organizational structure of most UK excavations devolves responsibility for excavation and recording of individual features, including graves, to individual highly experienced excavators, who usually do not have formal osteological training. While quality control mechanisms indicate that this structure provides a uniform recording base for stratigraphic relationships, planning etc., it is unlikely that there would be sufficient consistency for successful assessment of skeletal condition. However, the recent Bradford exercise, which was admittedly complicated by trying to assess bone that had been in long-term curation, clearly demonstrated that the basic recording currently used by physical anthropologists also lacks detail for the basis of an adequate baseline condition report.

Recommendations for Recording Condition

It hardly needs to be stated that the reliability of information derived from skeletal collections is directly related to their condition. From the outset it is important to establish a comprehensive record of bone condition in skeletal collections in order to assist in monitoring collections and to identify potential problems for collections management e.g. extent of handling and environmental control.

Conventional skeletal recording for the description of bone condition is limited in scope and not applied consistently enough to be useful for the purpose of monitoring collections. Problems largely stem from the fact that condition reporting is usually given a low priority and is often absent in the initial recording. Due to the volume of burials excavated each year extensive photography and radiography of most assemblages are not real solutions for this issue of condition assessment. For photography or radiography to be of real benefit (i.e. documenting the assemblage in sufficient detail), the cost would be unrealistically high. However, these techniques obviously do have a role with specific material, e.g. palaeopathological specimens.

A condition assessment for skeletal material should include both pictorial and descriptive recording, covering factors such as:

1) completeness of bone elements according to region
2) condition of bone, e.g. cortex--locality and extent of surface loss
3) presence/ locality of post-excavation breaks
4) location of repairs (including temporary measures e.g. use of masking tape etc.)/ conservation methods and their success or failure
5) presence/ locality of adherent deposits and infiltrated deposits, where possible.

Certain of these parameters, e.g. presence/ absence, are easily quantifiable. Others such as the degree of surface loss are much more difficult to document in a manner that can be easily replicated between assessors. This is the subject of ongoing work.

Having established the need for a systematized, standard condition report for all excavated skeletal material, the key questions are when the condition report should be made and by whom? Ideally this would be as soon as possible after excavation and within the framework of post-excavation assessment (MAP 2 phase 3). It is essential that a specialist with formal training in physical

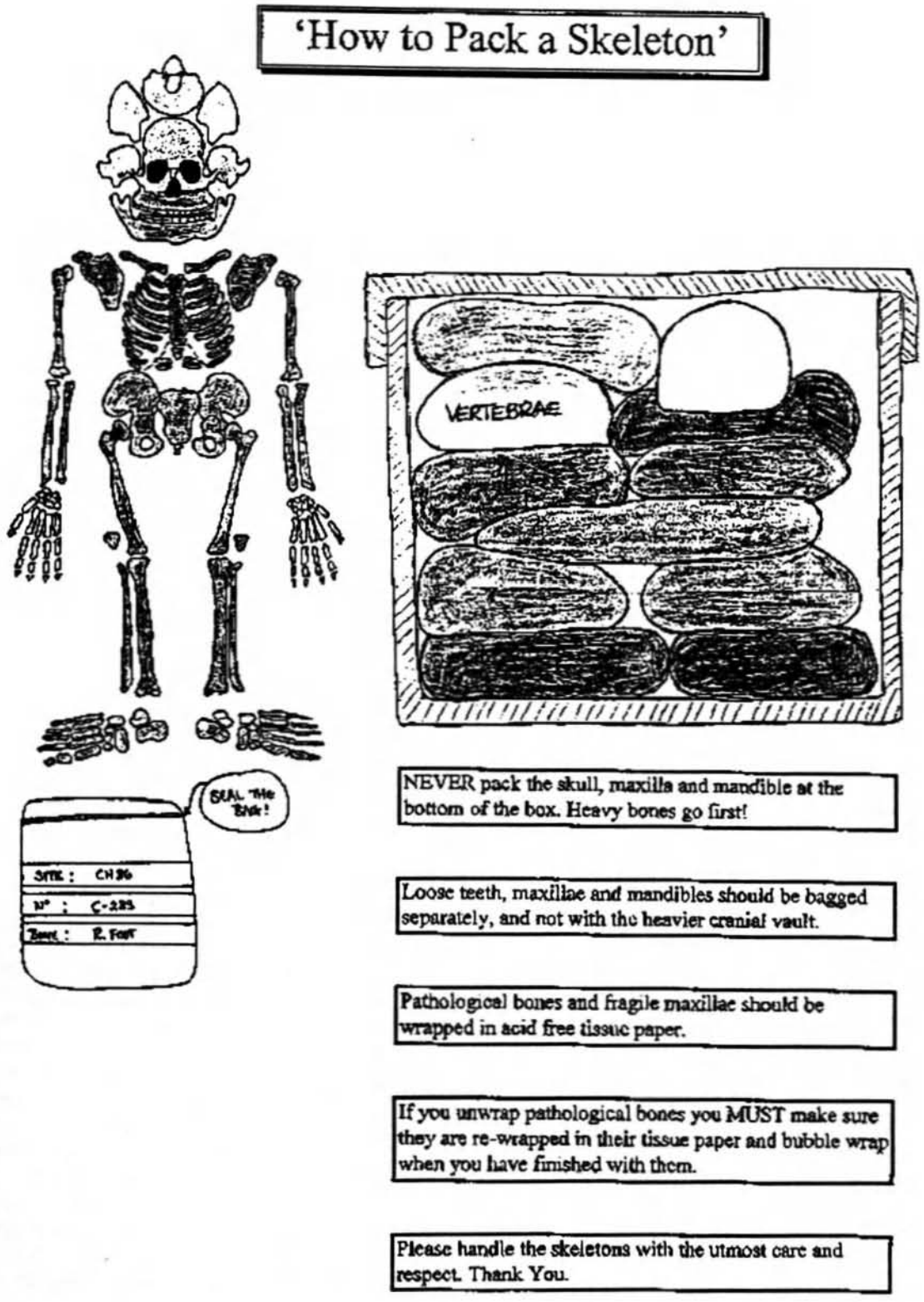

Fig 1. - A copy of a color-coded poster from The Calvin Wells Laboratory, Bradford University, produced by Mary Lewis. This system with its emphasis on heavy bones being placed at the bottom of the box was a good first stage in trying to improve packaging of skeletal material. However there are still too many bones bagged together without specific guidance on use of cushioning materials. Ideally the skull and maxilla should be in a separate box. However, resources for re-boxing material already in the collection are limited. Even this simple to follow scheme is not always followed.

anthropology carry out this task. Damage during excavation and processing will be evident by the presence of clean breaks. If the survey is done at this juncture, prior to any extensive handling in store, then a distinction can be made between damage caused by the excavation process and that caused by subsequent use. An integral part of this process is repackaging, labeling to appropriate archival standards, quantification of number of elements present and the establishment of an access log for each skeleton.

Long-term Curation of Skeletal Collections

Due to the lack of centralized records it is difficult to estimate the number of archaeological skeletons in storage in the UK. Roberts estimated that there were a minimum of 30,000 in 1985 and this has probably grown to at least 40,000 at present. Although some material is lost due to reburial, there are probably on average 2000 burials excavated each year. This figure fluctuates wildly due to the extent and nature of building developments, as well as the excavation of large cemeteries in early urban centers – e.g. the 1999 excavation in St. Mary Spital, London.

Standards in Collections Care

Standards are laid down for the preparation and long-term storage of excavated material including human bone. Key documents are the United Kingdom Institute for Conservation's *Guidelines for the preparation of excavated archives for long-term storage* (Walker 1990) and the Museum and Galleries Commission's *Standards in the Care of Archaeological Collections* (MGC 1992). However, human remains are not always curated within formal museum stores. Human remains are often retained for varying periods by excavation units and university departments, where museum standards are not always so rigorously enforced. This should not be a justification for the removal of all human remains to receiving museums at the earliest opportunity, as access for teaching and research are the principle justification for retention in a collection. Clearly museum standards need to be applied to all skeletal material in storage. The pertinent sections of the MGC standards state: "The museum should be sensitive to the issues involved with the curation of human remains and material of ritual significance" (paragraph 1.8). Paragraph 2.3 states "Finds, samples and all other records must be physically prepared and packed, catalogued and numbered by the excavating body, in a form agreed between the excavating body and the museum before they become the responsibility of the museum." "Full site documentation to a standard and in a form agreed between the excavating body and the museum must accompany the finds" (paragraph 2.5). The implications of this are clear: it is not the sole responsibility of the receiving museum to package human bone adequately and a baseline condition report commissioned by the excavators from a physical anthropologist as part of MAP2 phase 3 should be an integral part of handing over the archive. The cost of this would have to be budgeted within the overall fee for the report on the human remains and ultimately passed on to the developer.

Recommendations for Good Practice

In the field:

Skeletal elements should be lifted and placed into plastic bags. These bags should be transported from the site in a crate or box of sufficient size to accommodate all the bone with ease. Separate boxes should be used for the skull/mandible and the rest of skeleton. Any fresh breaks caused by excavation should be recorded on the skeleton recording sheet. Any especially fragile bone should be individually bagged with adequate support and packing (aluminum foil and polyether foam). Bone should be sent for washing as soon as possible after lifting. Adhering earth should not be allowed to dry onto the bone prior to cleaning. For this reason paper bags that have been advocated by some authorities in the past should not be used. Sealed plastic bags do have a tendency to sweat, and care should be taken not to promote fresh microbiological growth by creating warm, moist, oxygenated conditions within the bags.

Washing:

Bone that is too badly degraded to be processed in the normal manner must be screened out. This requires personnel with appropriate experience to manage this process. The time between excavation and washing should be kept to a minimum. Washing should be with cold or tepid water. The bone should not be immersed and only soft brushes should be used. Quality-control procedures should be in place to ensure that small skeletal elements, detached teeth etc. are not lost during the washing phase. One approach to this is to wash the bone over a sieve or nylon mesh. Washing areas should be provided with suitable drying racks that ensure maximum protection for the bone while wet. Air-drying should be in a controlled environment, out of direct sunlight and not too rapid, or cracking and splitting may result.

Re-packing, marking:

The first stage of post excavation processing, after washing, should be repackaging and a condition report. The packaging should be in custom made boxes and these should be large enough for the longest skeletal elements. Padding in the form of bubble-wrap or jiffy foam should be used to minimize damage. Skulls should be kept in separate boxes, with appropriate padding. All boxes and packaging should be of archival quality acid-free materials. If polythene bags are used, these should be punched to prevent moisture retention. All bone not destined for immediate reburial should be marked (the only failsafe way of ensuring skeletal elements do not get mixed between boxes). At this stage a base line condition assessment should be made.

Storage Conditions

Minimum conditions for the storage of archaeological materials are clearly laid down by Museums and Galleries commission (1992):"All objects must at all times be provided with appropriate physical support" (paragraph 12.1). "Packing and support materials must be inert and must not affect the object in any way" (paragraph 12.22).

"All objects should be handled wearing clean white cotton or polyvinyl surgical gloves" (paragraph 12.5). "Staff, researchers and volunteers must be trained in the handling and moving of objects" (paragraph 12.9).

Recommended conditions for the storage of bones is an ambient temperature of 18°C (minimum 10°, maximum 25°C) with an ambient relative humidity of 50%. Too high a humidity will encourage microbial activity. This was clearly demonstrated by the histological analysis of a charnel deposit stored in very damp conditions at Rothwell, Northamptonshire (Garland *et al* 1988). If the relative humidity is allowed to fall, archaeological bone has a tendency to crack and warp, often associated with flaking of cortical bone. This has been observed at Bradford in bone kept in laboratories, where the RH can often fall 35% RH under winter central heating. The lowest recorded RH has been 27%. The important point is to limit fluctuations in temperature and humidity.

Use of adhesives and other repair materials

Work in osteological laboratories often does not follow best practice with respect to the use of adhesives and consolidants. Adhesives need to be selected so that they conform to conservation standards:

- The adhesive must not be stronger than the material it is being used on. Otherwise it causes problems of parallel breaks.
- It must be reversible in a solvent that does not damage the bone.
- It must not adversely affect the bone.
- It should be assumed that any adhesive, consolidant or its associated solvents might negate future chemical analysis of the bone.

While a number of materials that are currently in use do conform to these standards (e.g. cellulose-nitrate adhesive, Paraloid B72), many do not (Horie 1987). In particular the paper by Stephens and Heglar (1989), which advocates the use of an electrically heated hot-glue gun has been particularly damaging. While this technique was originally advocated for reconstruction of bone in forensic cases (still dubious), it has crossed over into archaeological practice.

This technique is suspect for several reasons. The adhesive is not reversible nor is it stable to archival standards. There is also a risk of thermal damage to the bone. Additionally the glue is thick making it impossible to get a close join and the joint is too strong, which can cause parallel breaks.

With very fragile bone localized consolidation may be needed prior to re-assembly and the use of an adhesive. This work needs to be undertaken by a trained conservator with osteological experience.

Problems are also associated with temporary repairs. Again MGC guidelines are quite clear: (paragraph 12.28) "Do not use Blu-tack™, masking tape or plasticine in direct contact with objects; they stain and detach loose surfaces". More than one skeletal collection has been found to have stains from old masking tape, and Blu-tack™ has been found within teeth sockets. The latter causes a particular problem, as it is radiographically opaque.

A relatively recent problem encountered is the use of Paraffin wax on skulls and mandibles, in order to build up missing bone, prior to facial reconstruction. The wax is extremely difficult to remove. The use of solvents will only transport the wax residues deeper within the bone, and the use of heat is entirely unacceptable. There is clearly an urgent need to review practice used by all specialists, as there are some very damaging practices that appear to be widespread.

Access restrictions and access logs

Clearly because of the sensitive nature of human material all collections must have some form of formalized controls regarding access and extent/ rate of handling. However, if access is too tightly restricted this undermines the justification for curation of the material. Access to collections should be logged and ideally each skeleton box should have a log on the lid – which indicates each time the material is taken out of the box and by whom. In addition collections that are used for teaching may need to modify this record to take into account distinctions between research and teaching access. This specific handling log is essential to monitor the level of use and handling of individual skeletons. The log can be used in conjunction with any recorded deterioration of the material, based on the initial condition assessment form, to make modifications to access arrangements. For instance high-risk material includes bone in poor condition even when handled occasionally, as well as more robust bone that is receiving excessive use. Part of the log would also record the removal of individual skeletal elements for destructive sampling.

What should be included in condition survey

It is recommended that a proforma sheet be used. This should include detailed outline drawings of individual bones that can be marked using color codes for the following: fresh breaks, old breaks, loss of surface, repairs and joins, and adhesive deposits.

Who Pays?

It is clear that the implementation of best practice involves greater expenditure on consumables and staff time. It is also clear that failure to conform to these standards results in the degradation of a valuable scientific resource and undermines the ethical justification for the retention of human remains in collections. Under current UK planning guidelines (PPG16) the costs of archaeological work are met by developers using archaeological contractors secured through competitive tendering, under the "polluter pays" principal (Thomas 1994: 146). The problem is that although essential post-excavation work should be costed within the overall contract, it is this area that tends to get squeezed in the production of a competitive tender. Within the system, regional archaeologists (termed curators) are

charged with quality assurance of the contracting archaeological units. However, in practice, curators have not always been able to force contracts towards quality work and away from the cheapest tender. In a commercial environment developers are keen to draw a clear distinction between the basic requirements of archaeological recording and long-term research and curation, which are outside their funding remit. Against this background it is essential that the archaeological profession adopt uniform standards of recovery, assessment, analysis and curation of human skeletal material.

Reasons For The Variance Between Best Practice and Reality

Before proposing the implementation of more rigorous standards some consideration needs to be given to why current ones are not universally adopted. One particular problem is that there is not a clear, up to date, unambiguous set of standards that is applicable to the bulk of human bone. Some of the field procedures advocated in the conservation literature are overly complicated and only really applicable to a minority of burials. In addition there has not been sufficient guidance by conservation and museum professionals for the recovery, packaging, assessment and curation of human bone. There is a need to establish industry-wide standards that are accepted within a tendering environment, and thus enforceable by archaeological curators. With material excavated under developer funding, the full costs of condition reporting and suitable packaging materials must be built into the contract and not left for receiving museum to pick up.

Conclusions

The archaeological skeletal collections housed in UK institutions are of immense scientific value that extends well beyond the remit of traditional archaeology. Human remains are currently in permanent, medium term and temporary storage within a range of management structures including excavation units, museums and universities. Although the conditions of collections care vary considerably, generally human bone fares worse than equally fragile artifacts recovered from excavation. Specific skeletal collections are subject to high levels of access and handling pressures due to teaching and/or research e.g. Calvin Wells Collection, Bradford. There is an urgent need to improve best practice for the recovery, assessment and care of these collections. An important first step is to instigate standardized condition reports for human bone.

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