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Problems of Recovering Partial Human Remains at Different Times and Locations: Concerns for Death Investigators

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ABSTRACT: Examples of cases where partial remains of the same individual were recovered at different times and from separate locations are presented. Such remains raise unique problems for coroner/medical examiners and police because their discovery has the potential to confound identification and disrupt investigative continuity. Recovered partial human remains highlight the need for their proper documentation and raise the question of their release for burial or retention for evidence.

KEYWORDS: physical anthropology, forensic anthropology, partial skeletons, taphonomy, disposition

Dispersed skeletal human remains are usually recovered from land surfaces in the same general area and over a short period of time. Under these circumstances recovered body units can reasonably be assembled and shown to belong to a single individual. Traditional methods that rule out commingling are based on consistency of age, sex, race, stature, similar weathering and robusticity of bone, congruency of articular surfaces, as well as context and association of discovery [*1,2*]. Snow and Luke [*3*] have developed a statistical approach to assess commingled remains.

When a body is present on land, human remains are commonly dispersed by scavenging animals [*4*]. Recovery of remains is most often incomplete when searchers overlook or fail to recognize them, or when they are not included within limited perimeters of search. Remains that have decomposed in aqueous current driven environments [*5,6*] or have been purposefully dismembered and scattered by human agency present special investigative problems [*7*].

Recoveries of partial human remains separated by unexpected distances, jurisdictional boundary responsibilities, or by excessively long time intervals, have important implications for law enforcement and death-investigation agencies. The reasons for this are (1) body part attribution to specific individuals may be missed; (2) personal identification may be confounded; (3) investigative continuity may be disrupted.

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Case Studies

The five cases that form the basis of this report are summarized in Table 1 and show dates of separate recoveries for different remains of the same individual, elapsed time interval between discoveries, distances that separated sites of discoveries, and agent of transport.

Case 1

In June 1982, a right lower limb, including the foot, ankle, tibia, and fibula was discovered washed up on the shore of Puget Sound, approximately 17 miles (27.37 km) south of Seattle, WA. Skeletal elements were connected by soft tissue. On the foot was a black sock and a black, ankle-length boot. Two and one half weeks later, on June 23, 1982, the fully clothed, decomposing remains of a 52-year-old man were found floating in Seattle's Elliot Bay. Both right and left hands, as well as the mandible and right patella were absent. The right leg was absent distal to the femoral condyles. The left leg was disarticulated, but entrapped in the left pants leg. On the left foot was a black sock and a boot matching that on the previously recovered leg. On the basis of matching clothing and complementary body units, the remains were attributed to the same individual. The lead to identification was established through a medicine container label in the deceased's pocket and confirmation was accomplished by pelvic x-rays (Fig. 1). The remains were released for disposition.

Case 2

A human cranium was discovered December 15, 1983. Dental x-rays identified it as that of a 16-year-old, white girl missing since April of 1983 (Fig. 2). Extensive searches by police and canine units failed to locate other remains in the immediate area. The cranium was released to surviving family for disposition.

TABLE 1—*Summary of case examples.*

Case	Exam	Date of Discovery	Interval Between Recoveries	Distance/Agent of Separation	Body Unit Recovered
1	#1	June 1982			lower leg
	#2	June 1982	2 weeks	17 miles/water	decomposed body minus right lower leg
2	#1	December 1983			partial mandible
	#2	January 1986	25 months	⅛ mile/animals	cranium + infracranial skeleton
3	#1	February 1983			mandible
	#2	January 1986	35 months	¼ mile	cranium + infracranial skeleton
4	#1	1969			infracranial remains
	#2	1989	20 years	/animals[a]	cranium
5	#1	July 1985			cranium + left innominate, right tibia, right and left femur shafts
	#2	February 1990	5 years	185 miles/human	mandible + misc. vert and ribs, sacrum, upper extremity long bones (see Fig. 5)

[a]Location of infracranial remains not specifically documented. Information provided to author (WDH) was that cranium was found "in the same general area."

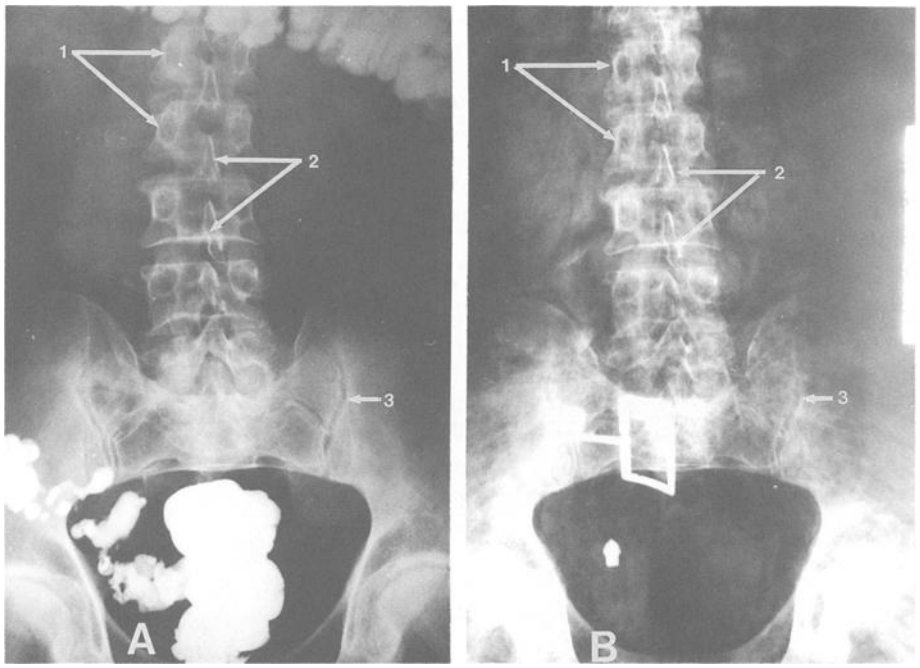

FIG. 1—*Case 1: Comparison between antemortem radiograph* (A) *and postmortem radiographs* (B) *of pelvis and lumbar spine. Example points of correspondences are: (1) internal anatomy of the pedicles of the lumbar vertebrae; (2) neural spines of lumbar vertebrae; (3) anatomy of right and left sacroiliac joints.*

Approximately 24 months later, in January of 1986, skeletal remains, without a cranium and mandible were discovered on a wooded hillside approximately ⅛ mile (0.20 km) from the site of discovery of the cranium. Because of proximity to the 1983 cranium and presence of complementary skeletal elements, investigators concluded that the cranium and other skeletal remains were from the same person. Positive identity and association was confirmed by comparison of antemortem and postmortem knee x-rays (Fig. 3). These remains were released to the family for disposition.

Case 3

In February of 1983, a partial human mandible that showed evidence of animal damage was brought to a residence by the family dog. The residential area was sparsely populated and surrounded by extensive wooded hillsides. Despite searches by investigators and surveillance of the dog, no other remains were located. Anthropological examination showed that the mandible was that of a 16 to 22-year-old female. No positive identification was made and the remains were retained as an unknown.

Approximately three years later, in January of 1986, a cranium plus infracranial skeletal remains were recovered ¼ mile (0.40 km) from the residence where the mandible was recovered. Again, the geographical proximity of these two events triggered their association. The mandible and cranium were confirmed as belonging to the same individual based on the age, sex, congruency of dental arches, articular matching, and dental wear facets. The individual remains unidentified and has been retained by the medical examiner as unidentified partial skeletal human remains.

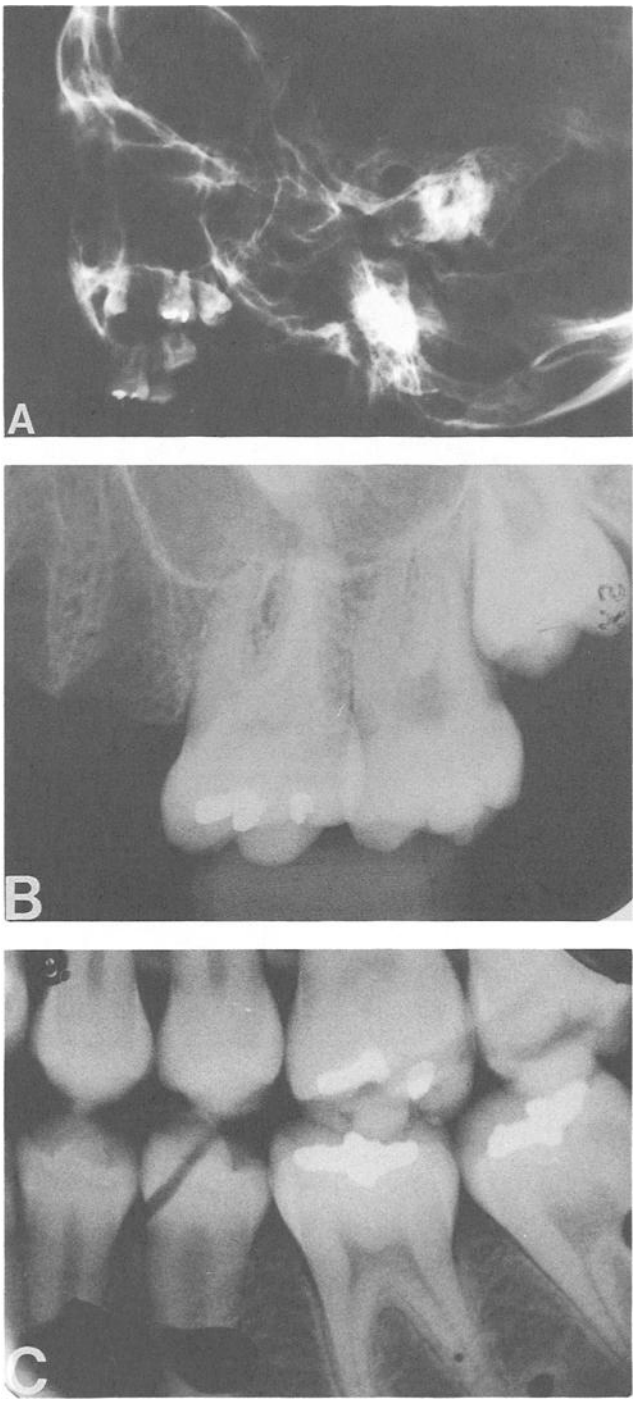

FIG. 2—*Case 2: Postmortem radiograph of a 16-year-old female's cranium discovered in February of 1983* (A) *and antemortem dental radiographs* (B) *and* (C). *Note correspondence of first molar dental restorations* (B), *and first molar dental restorations and second molar anatomy* (C). *(Film* C *has been reversed for comparison purposes.)*

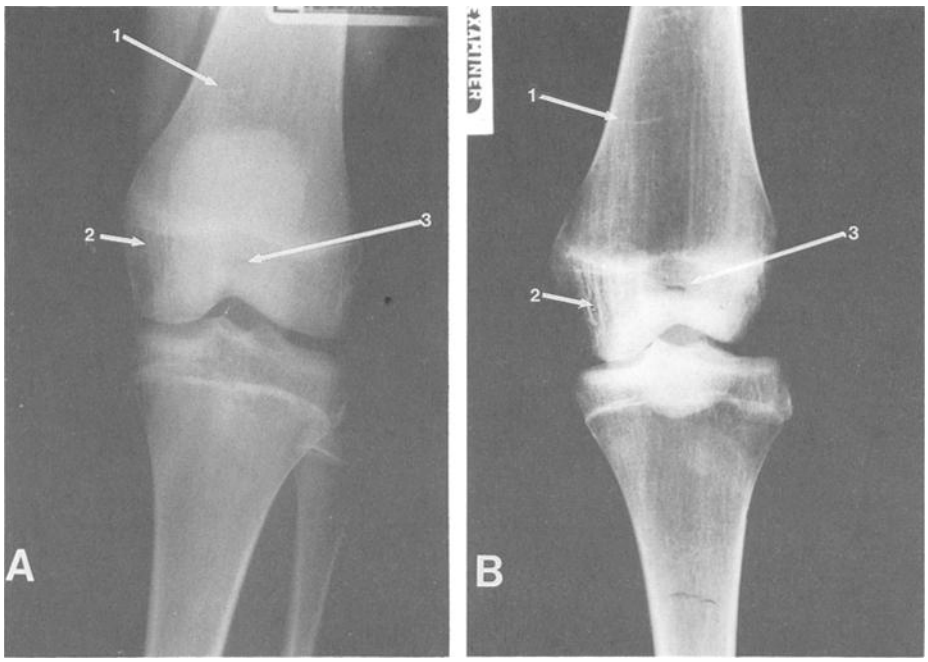

FIG. 3—*Case 2: Points of comparison between antemortem radiographs of the victim's knee taken at age 14* (A) *and postmortem radiographs from the same victim at age 16* (B). *Discovery of the infracranial remains took place 25 months after discovery of the cranium depicted Fig. 2. Points of correspondence are: (1) an incomplete, opaque transverse stress line 4 cm above femoral epiphyseal line; (2) coarse vertical primary trabeculation of the medial femoral condyle; (3) oval nutrient canal in the intercondylar fossa. More complete epiphyseal union has occurred from the time the antemortem radiograph was taken and there is rodent damage to lateral border of femoral condyle and tibial plateau.*

Case 4

The decomposed infracranial remains of a 17-year-old, female, confirmed homicide victim were recovered and identified from the Washington Olympic Peninsula in 1969. The remains were released to the family and cremated. In 1989, a cranium was found in the same area. It was extensively weathered, gnawed by rodents, and consistent with a postmortem interval in excess of several years. No antemortem skeletal or dental documentation was available. The cranium was ascribed to the original skeletal remains recovered 20 years earlier. The association was established by photographic superimposition.

Case 5

In February of 1990, partial skeletal remains were found a few miles south of Seattle. Upon discovery the skeletal elements were in relative anatomical position and in only slight disarray. Associated with the remains, and recovered in the screening process, were a maxillary left central incisor and a plastic device identified as a ventriculostomy shunt. In spite of a three day search of the area, no other bones were located. Skeletal elements showed no signs of carnivore activity or of signs of dismemberment and only slight rodent gnawing damage was present. Because the remains had been relatively

undisturbed, and no further portions of the skeleton were recovered, this was considered uncharacteristic.

Anthropological examination showed the remains were those of a 22 to 28-year-old, black female, between 5 feet 1 inch to 5 feet 4 inches in height. Postmortem interval was estimated as being in excess of two years. Cause of death was attributed to homicidal violence of undetermined origin.

Record review of other skeletal remains from the Seattle area failed to yield another partial skeleton that would complement the skeletal elements recovered. However, on July 12, 1985, east of Portland, Oregon, animal scavenged and commingled partial skeletal remains of two individuals were discovered. Identification of both individuals was assisted by records on file in Seattle-King County Medical Examiner's Office. These were records of persons reported missing from the Seattle-King County area and had been collected in connection with the Green River serial murder investigation. One of the individuals was a 26-year-old, black, female, 5 foot 2 inches in stature. Her identification had been based on a combination of skull radiographs that had been taken during neurosurgical placement of a shunt for treatment of a mild hydrocephalic condition (Fig. 4) and consistencies of dental records.

Although partial skeletal remains found in Oregon had been recovered and identified in Oregon five years earlier, the fact was that they were incomplete. Additionally, sex, age, and stature were consistent with the partial remains discovered in Washington, and the finding of a neurosurgical shunt was compelling enough to cause a reassessment of the findings. It was considered highly unlikely that these remains represented the same individual. Three possibilities existed (1) it was coincidental that two individuals with

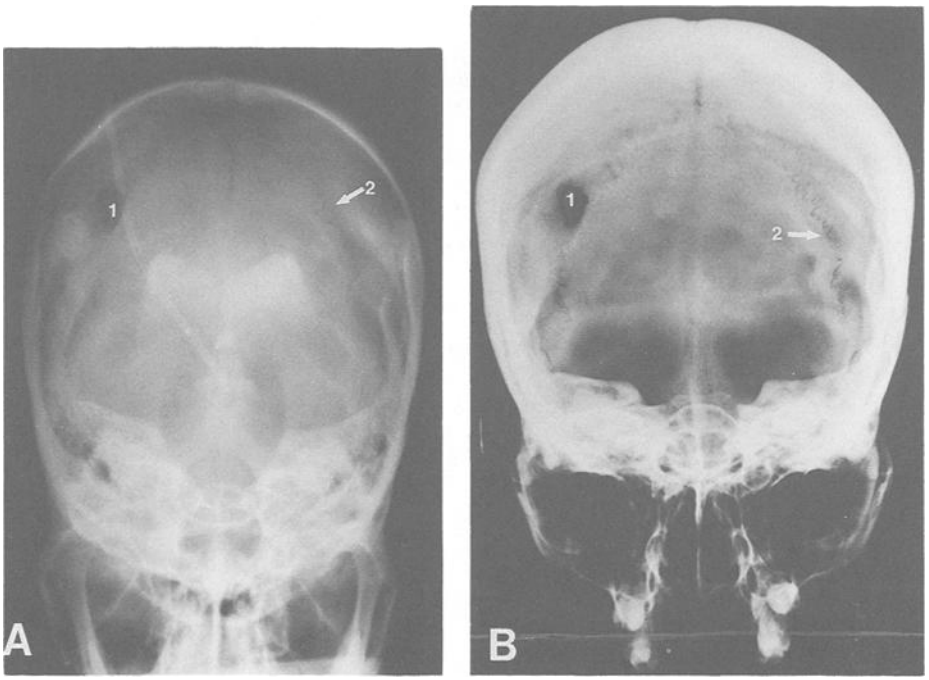

FIG. 4—*Case 5: The original 1985 identification of Case 5 based on comparison between antemortem radiograph of victim taken at the time of ventriculostomy shunt placement* (A) *and postmortem radiograph taken at time of autopsy when the victim was 26 years of age* (B). *Points of correspondence are: (1) ventriculostomy defect; (2) and identical pattern of the lambdoid suture.*

neurosurgical shunts were recovered as partial skeletons; (2) misidentification had been made on the original Oregon remains in 1985; (3) partial remains of the same individual were present at two distinct sites. The third seemed most unlikely because these skeletal remains were separated by 185 miles.

The Oregon State Medical Examiner's Office was contacted to reassess the 1985 identification. Skeletal inventory comparisons between the Oregon and Washington assemblages showed that they complimented each other. Figure 5 depicts an assembled composite of bones from the two sites of Oregon and Washington. The Oregon remains had been retained because the family did not take responsibility for disposition.

Results of the analysis confirmed both skeletal finds indeed represented parts of the same individual. Table 2 and Figs. 5, 6 and 7 summarize the key points of association and identification. Resolution of the identity of these skeletal remains provided investigators with direct evidence linking homicidal activity in both Oregon and Washington. The pattern of distribution and skeletal modification was most consistent with removal of bones from Washington to Oregon, after decomposition and disarticulation of the Washington body.

Discussion

Initial association in the majority of the above cases was inferred because of the geographical proximity of the discoveries. In all but Case 5 associations were assisted by jurisdictional integrity that is within a single jurisdiction and usually with the same investigators. This is the ideal situation for making a connection between separately recovered partial human remains. As a general rule, the potential for association of temporally and/or spatially distanced recovered body units is higher, the shorter the time interval between discoveries, the closer the proximity of recovery sites, the closer the communication between jurisdictions responsible for partial body parts, and regional

TABLE 2—*Summary of points for identification and association between partial skeletal remains recovered near Portland, Oregon July 1985 and those recovered February 1990 near Seattle, Washington.*

- Complimentary skeletal elements between both recoveries, and consistency of their age, sex, and stature (Fig. 5)
- Congruence of Oregon cranium with Washington mandible in respect to occlusion, dental wear facets, and temporal-mandibular articulation
- Favorable radiographic comparison between antemortem and postmortem basal views of cranium in respect to lambdoid sutures and ventriculostomy defect (Figs. 4, 6)
- Consistency of medical history relating to placement of neurosurgical shunt and Oregon cranial defect with Washington shunt
- Favorable radiographic comparison between antemortem and postmortem lateral skull x-rays in respect to such anatomical features as frontal sinuses, middle meningeal artery pattern, hard palate, sella turcica and associated posterior and anterior clinoid processes, and dental anatomy (Fig. 6)
- Upper left maxillary incisor recovered fromWashington radiologically consistent with antemortem radiographs, and fit with socket
- Favorable radiographic comparison between antemortem dental radiographs and postmortem radiograph of mandible in respect to dental anatomy and denta restoration (Fig. 6)
- Congruence of articular surfaces between Oregon cranium and Washington C-1, Oregon left innominate with Washington sacrum (Fig. 7)

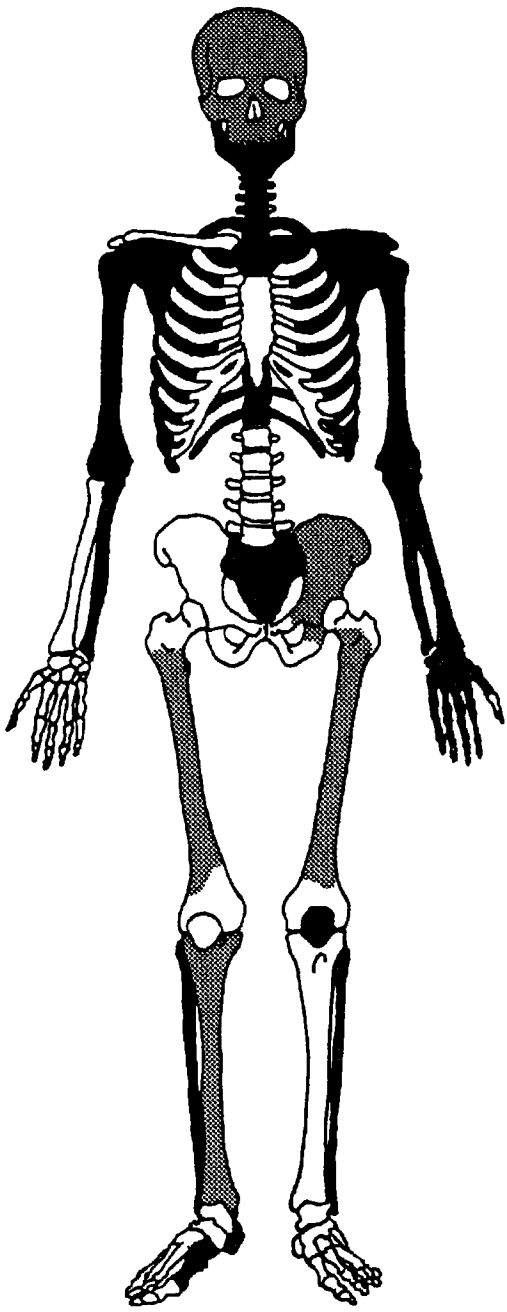

FIG. 5—*Case 5:* (A) *Composite of skeletal remains recovered from near Portland, Oregon in 1985 (solid shading) and Seattle, Washington in 1990 (stippled shading).*

awareness of the status of partial body discoveries. Once inferences of association are made, objective confirmation of the association is needed.

When partial remains are recovered, a concern for medical examiners and coroners is whether they should be released to family or retained. Both courses of action have their

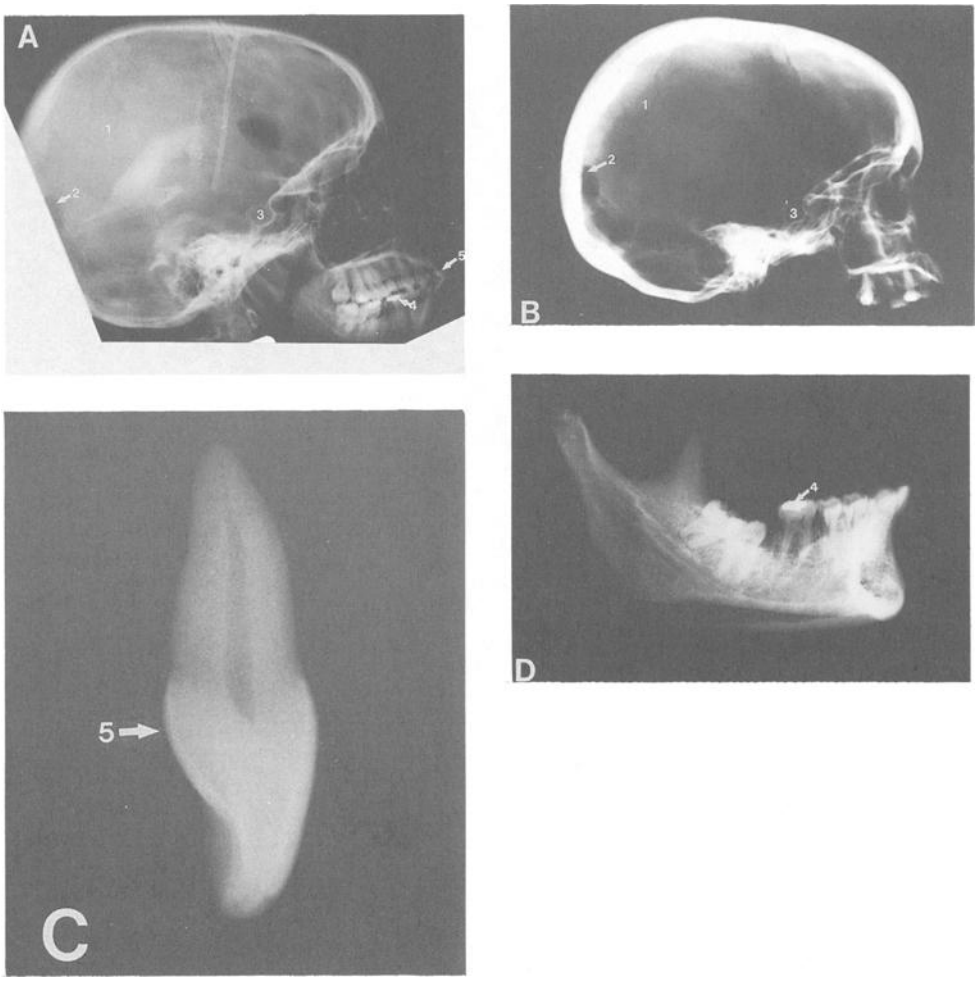

FIG. 6—*Case 5: Comparison between antemortem radiograph of victim's skull* (A) *and postmortem radiographs of cranium recovered in 1985 from Oregon* (B). *The central incisor* (C) *and mandible* (D) *were recovered in Washington in 1990. Among points of comparison between the crania* (A & B) *are: (1) vascular pattern of the meningeal arteries; (2) ventriculostomy defect (partially visible at posterior margin of A; (3) consistency of the anterior cranial base including sella turcica; (4) dental restoration of molar. General morphology of mandibular dentition and are concordant between* A *and* D. *(5) The pronounced cingulum of central incisor* (C) *was observable in the original radiograph of* A.

advantages and disadvantages. The decision to release or retain partial remains can depend upon whether partial remains have been positively identified; their physical condition; and their relative completeness and the likely prospect of relating them to subsequent skeletal discoveries.

The condition of the remains may strongly favor their release. When body units have abundant soft tissue and muscles, or are decomposed but minimally skeletonized, they represent a retention and storage problem. Many jurisdictions lack refrigerated storage. Hence, release of flesh-bearing remains is a necessity. Totally skeletonized remains require less elaborate conditions and space for storage and are easier to store.

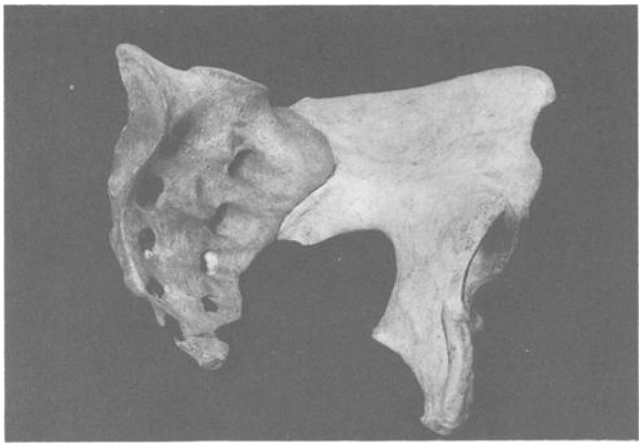

FIG. 7—*Oregon left innominate bone articulated with Washington sacrum.*

Two additional issues are involved with retention of positively identified human remains. First, when identified remains are not released to families the potential for exacerbating or prolonging grief becomes an issue. Second, the retention of identified remains represents a liability for the medical examiner/coroner agency. If remains are retained there must be guarantees preventing their loss or inadvertent destruction. If remains are lost or destroyed, responsible agencies are potentially subject to adverse publicity and to legal action, which entail financial settlements.[3]

Infrequently, even when complete bodies are recovered in homicidal deaths, there is pressure by police agencies or prosecutors to retain remains. Any time human remains are held at the behest of another agency, a clear understanding must exist between the involved agencies. The form of this understanding is best handled by establishing a written policy and procedure. The policy should delineate which agency is authorizing retention, the rationale for the retention, which agency has the responsibility for physical custody of the remains, and clearly define responsibilities of the custodial agency. Strict security and chain of custody must be maintained. Reasons for retention of remains must be periodically reviewed and re-evaluated.

The relative completeness of skeletal remains may have bearing on their release or retention. To positively link partial remains to each other requires either the availability of the original remains or adequate documentation for comparisons to be made. To test for congruency of articulating elements, availability of both sets of partial remains is ideal. If partial human skeletal remains are released to the family, the mode of disposition should allow retrieval if future need arises. Local burial, certainly not cremation, is the disposition of choice. Burial in another or remote jurisdiction may compromise or negate the ability to retrieve remains at some future time.

In the absence of the actual skeletal remains, the ability to match partial remains is dependent upon adequate documentation. For remains with flesh, blood or tissue samples for tissue typing or DNA analysis should be obtained. Complete body part inventories,

[3]The foregoing concerns were poignantly made to the King County Medical Examiner's Office in July of 1984 when the partial skeletal remains of two individuals could not be located. These remains had been positively identified in 1974 and held at the request of local police as "evidence." The plaintiff's lawsuit claimed $4.75 million in damages and cited stress that the deaths and subsequent loss of the remains caused the families. The issue was settled out of court for an amount reported to be a little over a quarter of a million dollars (Seattle Times, 11-4-87).

documented by description and radiography are crucial. This includes a specific inventory of frequently overlooked bones such as carpals and tarsals, metacarpals and metatarsals, and phalanges.[4] Individual teeth should be documented as to their anatomical position. Specialists such as forensic odontologist and anthropologists are essential for these analyses.

Circumstances of decomposition and disarticulation affect the likelihood of recovery. Certain missing body parts are less likely to be recovered than others such as body parts lost in large bodies of current driven water and elements of the hands and feet from heavily canid-scavenged remains. When no antemortem skull films or dental records are available, adequate documentation of maxillary or mandibular dentition should include molds to allow matching of these structures if the need should arise. If dismembered remains are being examined, surfaces of dismembered bones should be carefully cleaned and retained for toolmark characteristics and future associations with other body parts.

Confidence in attributing partial remains to a particular individual, will be tempered by the context of regional criminal activity and missing persons. For example, confidence in attributing partial remains to a single young woman from a rural region where few missing persons are known is quite different from a large metropolitan area where many women of similar description are reported missing.

Inability to properly link one set of partial remains to another may disrupt investigative activities or create unnecessary mysteries. The attribution to one individual of the partial skeletal remains from Oregon and Washington, in Case 5, resolved crucial investigative questions in a serial murder investigation. Forging communication for the linkage across jurisdictions of dispersed body parts of potential serial murder victims is a great concern to investigators.[5] Skinner et al. cited frustration and waste of time and effort required to identify the mandible belonging to an already identified person who had been discovered two years previously [*6*]. In all situations where a body part is not attributed to an individual, the result is an unidentified remains.

Lack of proper attribution can arise when there is more than one jurisdictional site of recovery. Territoriality and communication difficulties between police jurisdictions is an ongoing problem. Another complicating factor for a confusion of association and personal identification is that certain body parts are more likely to be represented in antemortem records. One skeletal element of a remains may hold evidence of cause or manner of death or be a vital clue to identity.

In conclusion, these five cases illustrate many problems associated with recovery of human remains separated by time and distance. As in all death investigations, assumptions can produce major errors. When partial skeletal remains are discovered, a clear recognition must be made that remains may not only be separated in time of discovery but widely separated by distance. Like in any death investigation, observations must be made with the anticipation of future issues connected to the present circumstances of discovery.

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[4]Inadequate skeletal inventory at time of autopsy, combined with subsequent discovery of previously uncollected skeletal part at the body recovery scene five years after the original scene processing, made exhumation of the body necessary in the Christine Jessop Case of Queensville, Ontario (The Globe Mail, 11-14-91).

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