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Multiple Animal Bite Wounds: A Case Report

One of the primary functions of any medical examiner system is to aid in the discovery and prosecution of crime. Implicit in this responsibility is the role of protecting the innocent when in fact no crime is actually found to exist. In the execution of day-to-day activities, the medical examiner/forensic pathologist must be alert to explore all avenues of investigation and utilize any of the multitude of scientific aids and specialists available.

The importance of forensic odontology in the process of body identification is well established [1]. One of the earliest recorded identifications in the United States dates back to the 18th century when Paul Revere identified the remains of Major General Joseph Warren by a fixed bridge which Revere had constructed for Warren just prior to his death [2]. In more recent times, forensic odontology has also turned its attention to bite marks as aids to the identification of individuals accused of various crimes [3]. Because bite marks, especially those of animals, may be mistaken for other types of wounds, it is important to make a thorough investigation of all parts of the external body, along with gathering as much information as possible from the criminal investigating team. To this end, a suspected homicide case is presented along with the techniques which were used to apprehend the culprits.

Case Report

One spring morning in 1974 in a large southwestern city, the nude body of a 13-month-old black female was discovered on a lawn by a lady as she retrieved her morning newspaper. The infant lay about 7 ft from an adjacent driveway on her back, legs spread apart. Numerous partially torn articles of infant clothing were found scattered about the vicinity. There were ten distinct blood stains present on the adjacent grass and sidewalk.

The initial police investigation established the identity of the child as the youngest sibling of three who had been left by the mother for safekeeping with an alcoholic grandfather who lived nearby. When questioned, the latter was unaware of the child's disappearance from his dwelling.

Within three hours of the discovery of the body, an autopsy was performed. On external examination, in excess of 80 puncture wounds were documented, covering virtually all aspects of the child's body (Fig. 1). All measured approximately $\frac{1}{4}$ to $\frac{1}{8}$ in. in

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FIG. 1—*The victim. Note the multiple puncture wounds over the entire body.*

external dimensions, and the majority penetrated to an approximate depth of $\frac{3}{4}$ in. Three wounds penetrated to a depth of 2 in. Many were widely paired. An anterior perforation of the trachea just distal to the cricoid cartilage was present. The airway was, however, patent and blood free. Another series of four wounds perforated the right 7th intercostal space, resulting in tearing of the pleura of the right lower pulmonary lobe and the development of a small pneumothorax. Numerous wounds were present about the neck and an anterior dislocation of the 6th upon the 7th cervical vertebra was present, associated with epidural hemorrhage and focal cervical spinal cord softening.

Several hours after the body was discovered, two female subjects approached the police and alleged a confession given to them by a male friend. The latter was reported to have stated that, while intoxicated in the early morning hours, he raped and murdered a female child. The forensic pathologist relayed to homicide investigators that his examination revealed no evidence of sexual molestation, and further that the pattern of injuries was most suggestive of an attack by a large animal rather than an assault by an ice pick or skewer.

With this information, police began intensive questioning of all residents in the general area of the death. Two children stated that, sometime before the discovery of the body, they noted two large dogs "tossing a doll around" in the general vicinity. Seventy-five feet from where the body was discovered was a fenced enclosure containing two German shepherd dogs, one mature and one immature. When questioned, the owner of

these animals admitted that the gate to the enclosure had been inadvertently left open during the evening and early morning hours when the death had apparently occurred.

With the development of this information the child's body and the dogs in question were subjected to further examination and comparison.

Techniques Employed

Because of the conflicting stories in this case, it was important to record, for comparison and evaluation, a number of the puncture wounds occurring on the body. To accomplish this end, impressions of the wounds were made (Fig. 2). The impression

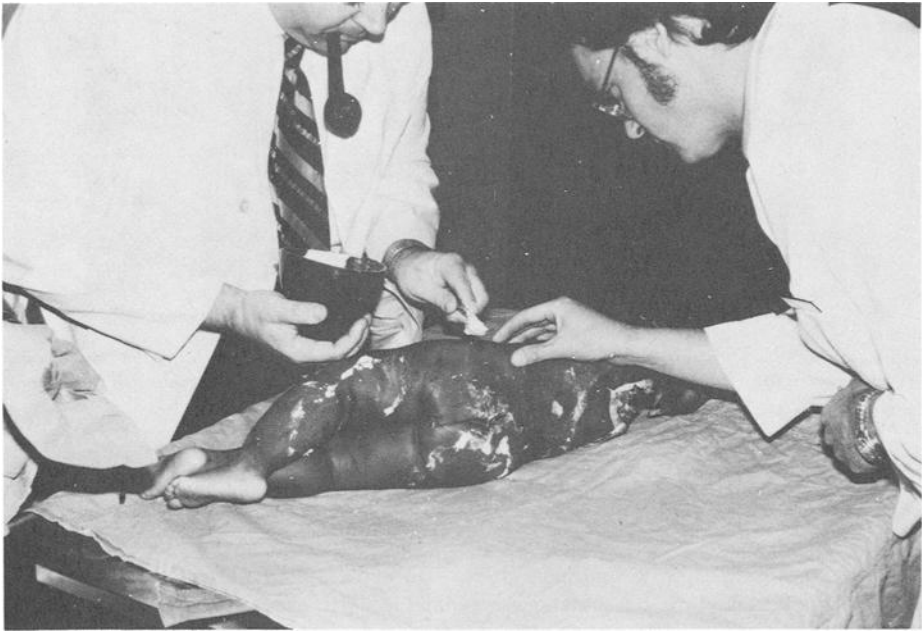


FIG. 2—The impression of the bite marks. Irreversible hydrocolloid is applied to the wounds using a mixing spatula.

material was irreversible hydrocolloid (Jeltrate, Type II normal set) which was mixed according to the manufacturer's instructions. While the material was plastic and being applied to the wound sites, paper clips (bent open with the two loops at 90 deg to each other) were inserted into the hydrocolloid. When the material had set, the loops of paper clips were sticking above the surface (Fig. 3). Dental plaster was then mixed to a whipped cream consistency and applied over the alginate, engaging the paper clips and completely covering the hydrocolloid. After the heat of set had occurred in the plaster the entire impression was removed. The wound marks were outlined on the impression with an indelible pencil to avoid confusion with artefacts and dirt which might occur during the pouring procedure. The impressions were poured immediately in dental stone because the hydrocolloid has a 15-min shelf life before dessiccation takes place. After the heat of set of the stone occurred, the impressions were separated from the models. Seven

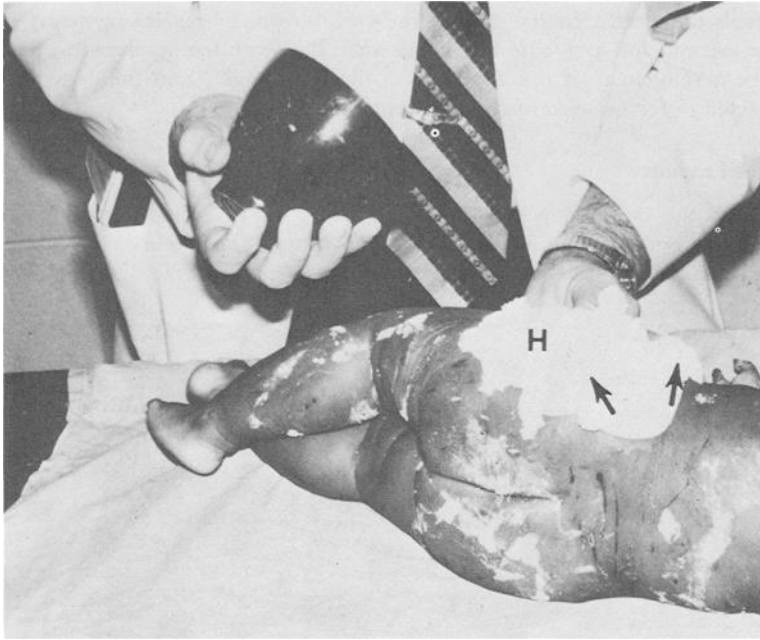


FIG. 3—The impression material on a body area having bite marks. Note the paper clips (arrows) protruding from the irreversible hydrocolloid (H) to aid in the retention of the dental plaster overlay.

impressions were taken on various areas of the body for comparison. The models were trimmed on a model trimmer to give a smooth edge. The indelible pencil marks on the impression were transferred to the models at the time of pouring.

Stone models of the dental arches of the two German shepherd dogs were made. The dogs were anesthetized at a veterinary office. Two upper and two lower trays were made using hard pink denture base plate wax. Standard size sheets (3 by 6 in.) of pink denture base plate wax were softened in an alcohol flame, and three thicknesses were molded to each of the dogs' upper and lower dental arches. After the trays had hardened in the desired shape, ropes of soft periphery wax were molded to the borders to aid in retaining the impression material. Holes were punched in the trays to allow impression material to escape, further aiding retention. Six scoops of irreversible hydrocolloid were mixed with very cold water to increase working time. The trays were loaded and impressions of the dogs' dentitions were made (Fig. 4). The impressions were immediately poured up in the die stone (Fig. 5). Die stone was used, because of its hardness, to reduce the possibility of fracture upon separation from the impression material. After thorough set had occurred in the stone models, each of the dog's models were compared with the body marks (Figs. 6-8) and with the models of the various parts of the body (Fig. 9). The tooth models consistently approximated both the wound marks on the body and on the body models.

Microscopic Examination

In order to further aid the identification process, the wounds were inspected for possible foreign bodies. A laceration in the midline of the mid back was found to have a

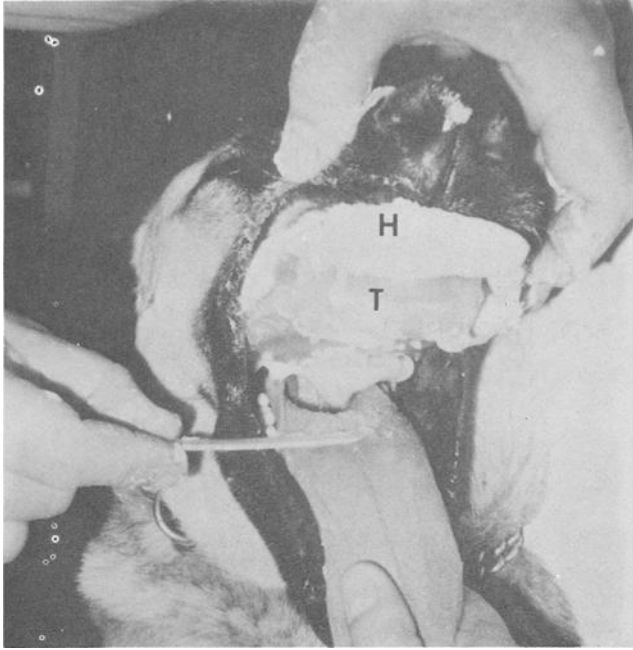


FIG. 4—The impression of the maxillary arch of one of the German shepherd dogs. Note that the wax tray (T) has holes to aid retention of the irreversible hydrocolloid (H).

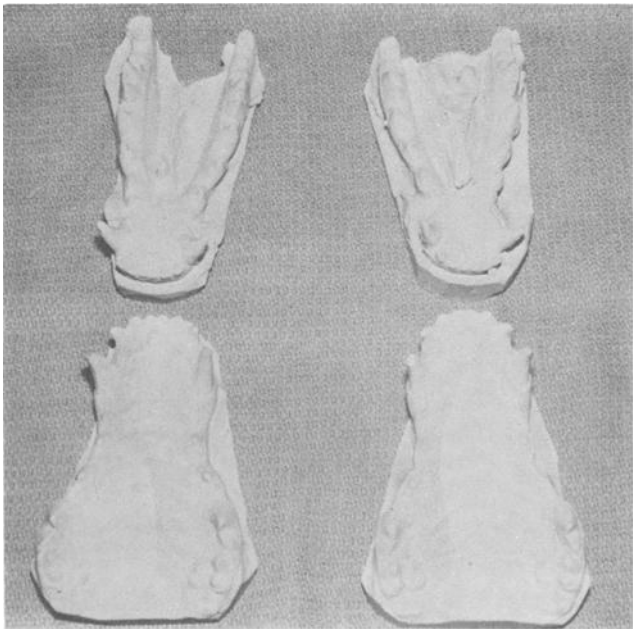


FIG. 5—The models of the two German shepherd dogs poured in a hard dental stone material.

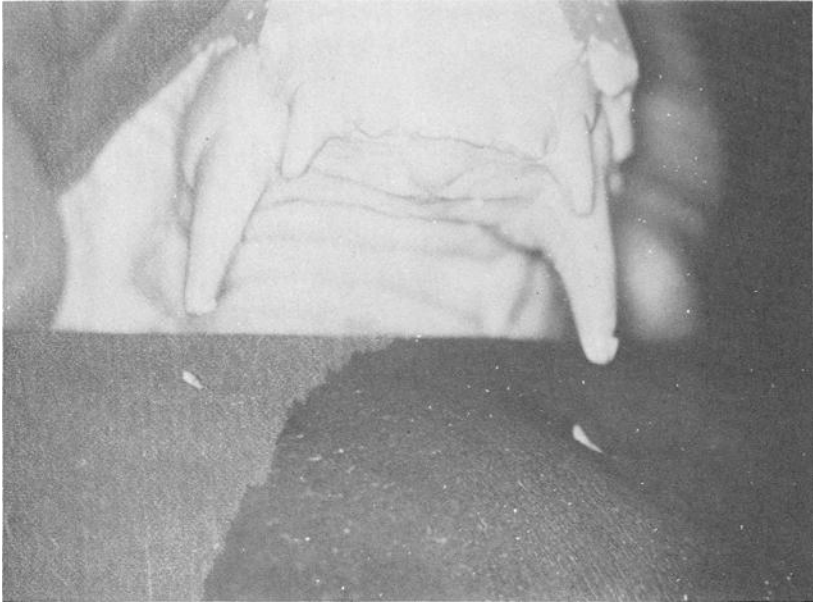


FIG. 6—A maxillary arch model approximating the bite marks in an extremity.

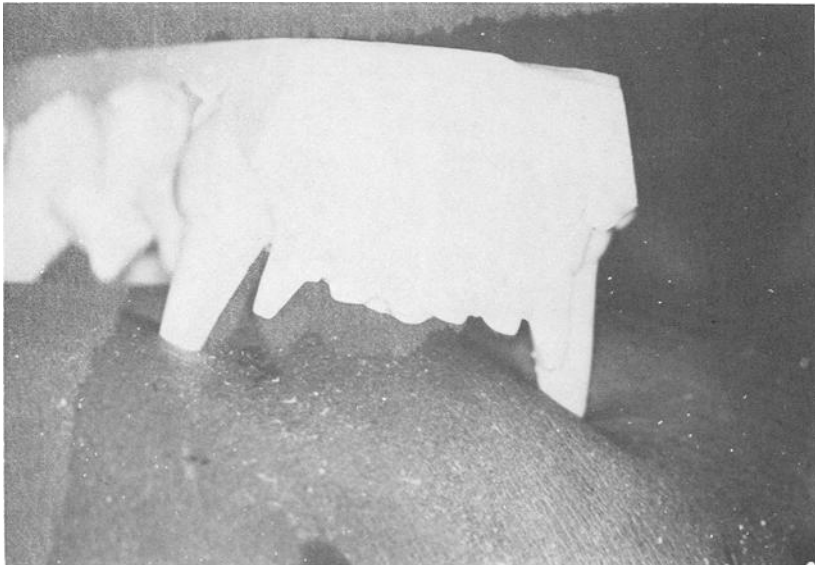


FIG. 7—The same maxillary arch model in position within the bite marks of the previous figure.



FIG. 8—A maxillary arch model within the bite marks on the right posterior neck.

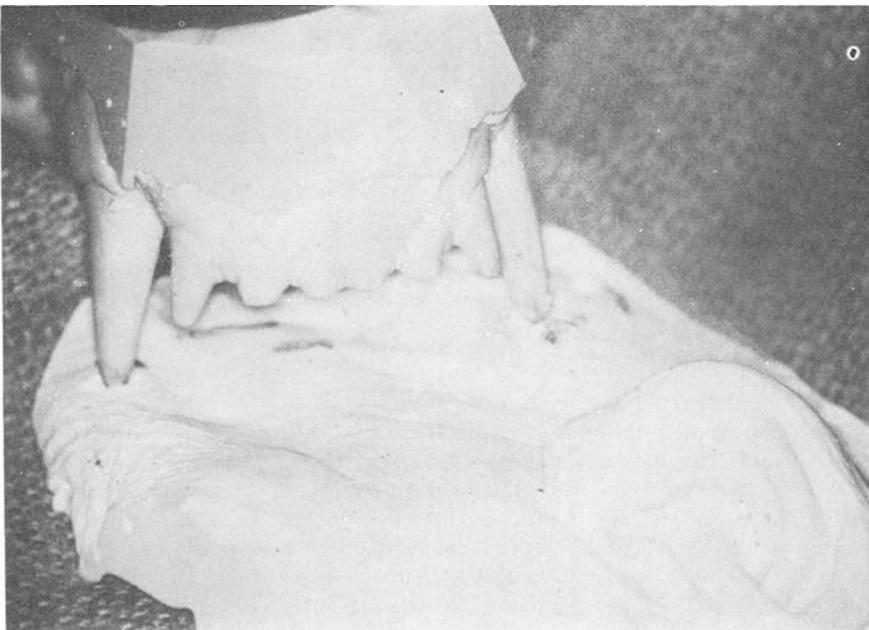


FIG. 9—The same maxillary arch model within the bite marks on the dental stone cast of the same area as the previous figure.

black material and was biopsied for microscopic examination. The specimen was stained with hematoxylin and eosin and examined using both polarized and plain tungsten light. Under plain light, the wound had several pieces of calcified material which had the staining qualities and morphology of dental calculus. The calcified material was quite birefringent using polarized light (Fig. 10). There were also several large accumulations

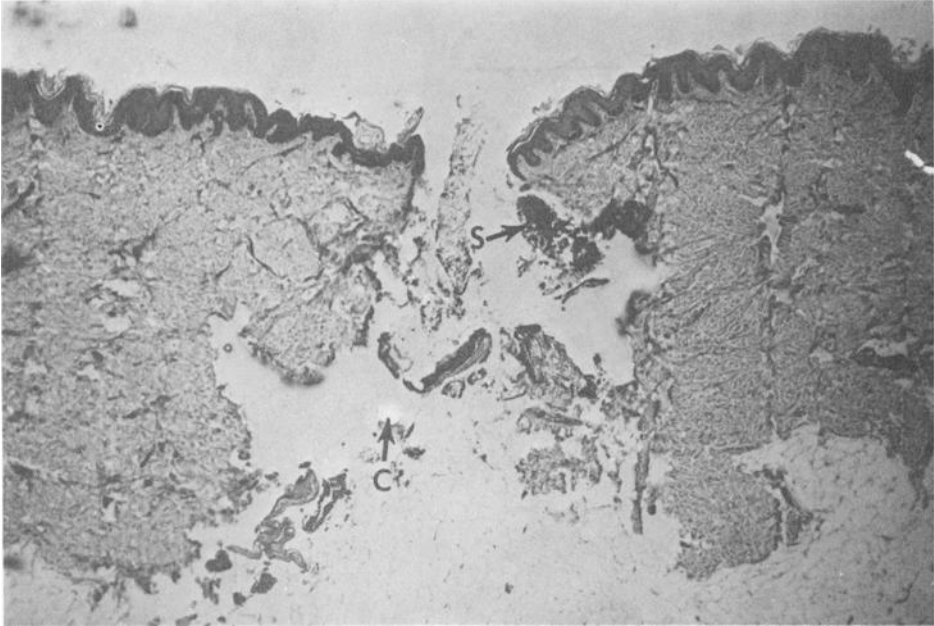


FIG. 10—A low power photomicrograph of a section through a bite mark in the mid back using polarized light. Note the presence of birefringent dental calculus (C) and of squames and microorganisms (S) (original magnification $\times 10$).

of debris within the wound consistent with those which might be found in saliva. The debris contained squames and several types of microorganisms (Figs. 10 and 11).

Discussion

This case rather vividly exemplifies the dilemmas which can arise in the investigation of a homicide. Faced with the alleged confession of a rape and murder of a small child, the criminal investigative team detained a suspect. However, after an evaluation of the wounds on the victim's body it was determined that the injuries were inconsistent with those caused by an ice pick, knife, or other such instrument. Specifically, the wounds were consistently symmetrical. The variation in depth of the wounds suggested that they were made by both a young animal with sharp teeth and an older animal with more blunt teeth. These findings were borne out when the dogs' models were compared with the body wounds.

Triratana [4] has pointed out that while animal bites can be easily distinguished from human bites, all animal bites are not the same. He states that watchdogs tend to bite

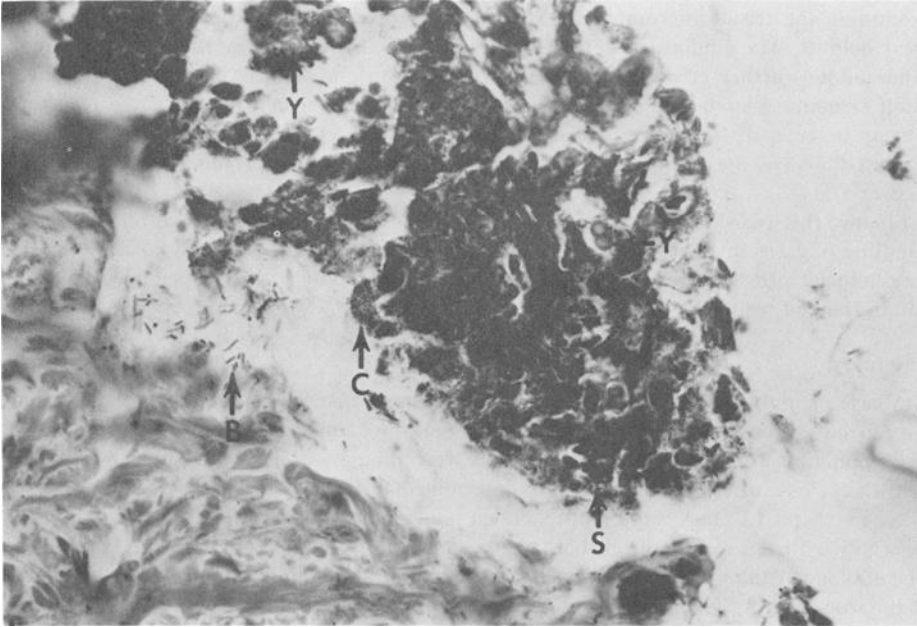


FIG. 11—A high power photomicrograph of debris found in a bite wound. Note the presence of squames (S), cocci (C), bacilli (B), and yeast forms (Y) (original magnification $\times 100$).

and hold their victims, yielding a distinct, clear bite mark. Angry dogs move their heads as they bite which tears the tissue and makes it more difficult to evaluate. In the case presented, the fact that the wounds varied in size is consistent with the story that the child had been tossed about by the dogs.

The techniques used in the case are also of interest because at the present time there is not a uniform method of investigation of bite marks—human or animal. Sebata [5], in a unique set of experiments, found that there is a discrepancy between the length and width of the bite marks and the dental arch, depending upon the anatomic site of the bite. Sucking added to biting alters the width of the bite marks as compared to the dental arch. The physiological reaction of the skin after the bite is inflicted alters the bite marks as compared with the dental arches, but this might be of aid in estimating the time of the bite relative to death. DeVore [3] pointed out that changes in the body position change the size and shape of bite marks on the skin. Van Hecke [6] found that the comparison between a bite mark on the breast of a victim and a bite mark into an apple at the police station was insufficient evidence to convict a suspect.

Furness [7] reviewed previously used techniques and suggested a new technique of photographing the bite marks on the skin of the victim and the casts of the suspect's teeth with the biting edges marked with printer's ink. The negatives are printed to correspond in size and compared for points of agreement. Luntz and Luntz [8] suggest that since no uniformly accepted technique exists, the circumstances peculiar to a case and the facilities available to the forensic dentist should dictate the techniques employed. These authors state that routinely, photographs and impressions of the bite marks should be made along with obtaining saliva trace evidence.

No mention is made in the foregoing papers of biopsying the site of a wound and

examining the tissue microscopically. In the present case, this procedure proved to be most helpful. The finding of dental calculus and debris consistent with those found in saliva added further credence to the theory of the origin of the wounds. While animal tooth structure can be differentiated from human tooth structure [9], there does not appear to be a distinction between animal and human dental calculus. It is also of interest that had the victim lived, infection would have been a prominent feature in the recovery.

Finally, this case demonstrates the importance of a multidisciplinary approach to the handling of cases involving bite marks. The forensic pathologist, the oral pathologist, the maxillofacial prosthodontist, and the veterinarian all applied their specialized skills to obtain the end result.

Summary

A case of multiple animal bite wounds is presented along with the techniques used to apprehend the culprits. The victim was a 13-month-old black female who had in excess of 80 puncture wounds. Initially the wounds were thought to be caused by a mechanical instrument but, after an autopsy, were determined to be caused by a large animal. Two German shepherd dogs were apprehended and impressions of their teeth compared favorably with the wounds from both the casts made from the body and the body itself. The etiology of the wounds was further substantiated by microscopic examination of one of the wound sites. The identification of bite wounds and the techniques used to confirm the identity of the culprit are discussed.

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