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Forensic Dental Identifications in the Greater Houston Area

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ABSTRACT: In order to confirm the identity of the deceased, 1.7% of the deaths (162 cases) evaluated at the Harris County Medical Examiner's Office during the time period of this study required a forensic dental evaluation. Data were collected and analyzed. The manner of death was ranked in order as follows: 30% homicide; 20% accident of various types other than motor vehicle accidents; 18% motor vehicle accidents; 16% remain undetermined; 9% natural causes; and 7% suicide. The cause of death was: 24% asphyxia, smoke inhalation, or thermal burn injuries; 23% blunt-force trauma; 18% miscellaneous causes of death; 15% undetermined; 13% gun shot wounds; and 7% asphyxia. The condition of the remains were: 38% charred or incinerated; 31% decomposing; 18% skeletal remains; 6% "fresh" or recently deceased; 4% fragmented; and 3% severely beaten or mangled with displacement of the maxillo-mandibular region, complicating the dental identification procedure. The gender was: 62% male; 34% female; and 4% undetermined. The race was: 55% Caucasian; 19% Hispanic; 14% black; 1% Asian; and 11% undetermined. The age was: 2% from 0 to 10 years of age; 9% from 11 to 20; 21% from 21 to 30; 18% from 31 to 40; 13% from 41 to 50; 8% from 51 to 60; 5% from 61 to 70; 4% from 71 to 80; 1% from 81 to 90; and 19% undetermined. Further evaluation of these and future dental identification cases will provide valuable data to help prepare the forensic dentist for the wide variety of cases that must be evaluated in the course of their careers.

KEYWORDS: forensic science, forensic odontology, forensic dentistry, forensic anthropology, human identification, forensic dental records, forensic dentistry and forensic medicine, dental identification, burn injury

Houston, Texas is the fourth largest city in the United States, with a population of more that 1.8 million. The population of the metropolitan statistical area is more than 4.3 million, and ranks tenth in population among the nation's metropolitan areas. The city of Houston, Texas lies in three counties—Harris, Fort Bend, and Montgomery. Harris county alone is the third largest county in the nation with a population of more than 3 million. The city of Houston covers 613 square miles. Greater Houston contains about 8778 square miles—an area more than double the size of Rhode Island (1). The number of deaths evaluated by the Harris County Medical Examiner's Office was 3638 in 1998, 3010 in 1999, and 3050 through October 2000, with a total of 9698 for that time frame (Jefferson S. Harris County Medical Examiner's Office; 8 Nov. 2000. Personal Communication). Cases that are taken to the Medical Examiner's Office for evaluation include: any unnatural death; any natural death without an attending physician; and deaths currently under investigation that a law enforcement agency has determined to be the result of foul play. In order to confirm the identity of the deceased, 1.7% of the deaths (162 cases) evaluated at the Harris County Medical Examiner's Office during the time period of this study required a forensic dental evaluation.

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Materials and Methods

A retrospective review of the cases requiring forensic dental identification in the Greater Houston area in the recent past was conducted. The 162 cases that were analyzed occurred over a 34 month period of time from January 1998 through October 2000. Pertinent data were collected and placed into a table for analysis. The table, with personal identifying information removed, is included in this paper (Fig. 1). Data concerning the cause and manner of death, the condition of the remains, the gender, the race, the age, and the circumstances surrounding each death were carefully studied.

Results

Manner of Death

The term "manner of death" indicates how a death occurred and is generally categorized as "natural" or "unnatural." Natural death occurs as the result of either old age or a disease process. Unnatural death is caused by an injury of some sort and is further subdivided into accidental, homicidal, suicidal, or of undetermined cause. Accidental causes are those events or injuries occurring without forewarning. Homicide is the killing of one human being by another. Suicide is the act of taking one's own life. Undetermined causes would be those for which there is insufficient evidence to make a definitive determination on the manner of death.

The manner of death in each of the cases studied was analyzed and ranked in order as follows: 30% of the decedents were the victims of homicide; 20% were related to an accident of various types other than motor vehicle accidents; 18% were victims of motor vehicle accidents; 16% of the manner of deaths remain undetermined; 9% of the deaths were due to natural causes; and 7% of the cases studied were the result of suicide (Fig. 2).

Cause of Death

The cause of death is the injury or disease process responsible for beginning the chain of events that will ultimately lead to death of the individual. The cause of death for each case was evaluated and ranked in order: 24% died from asphyxia, smoke inhalation,

Manner of Death	Race	M / F	Age	Cause of Death	Circumstances	Body Condition
Accident	W	F	11	SI&TB	House fire	Charred
Accident	W	F	15	A&SI	Plane crash	Charred
Accident	W	F	16	A&SI	Plane crash	Charred
Accident	H	M	20	CO poisoning	House fire	Charred
Accident	W	M	28	A&SI	House fire	Charred
Accident	W	F	39	Blunt force trauma	Car fire	Charred
Accident	W	F	39	Blunt force trauma	Plane crash	Charred
Accident	W	M	43	A&SI	Plane crash	Charred
Accident	B	M	48	Blunt force trauma	Car fire	Charred
Accident	W	M	52	Blunt force trauma	Plane crash	Charred
Accident	W	M	52	Blunt force trauma	Plane crash	Charred
Accident	W	M	56	A&SI	Plane crash	Charred
Accident	W	M	58	Blunt force trauma	Plane crash	Charred
Accident	W	M	60	A&SI	House fire	Charred
Accident	W	M	66	A&SI	House fire	Charred
Accident	B	F	72	A&SI	House fire	Charred
Accident	H	M	U	Drug overdose	Floater	Decomposing
Accident	H	M	U	Drowning	Floater	Decomposing
Accident	H	M	U	Blunt force trauma	Auto-pedestrian	Decomposing
Accident	W	M	41	Drug overdose	Welfare check	Decomposing
Accident	W	M	41	Drowning	Floater	Decomposing
Accident	W	M	45	Drug overdose	Welfare check	Decomposing
Accident	A	M	3	Cardiac Arrest	Died during tx.	Fresh
Accident	B	F	33	Blunt force trauma	Auto-pedestrian	Fresh
Accident	W	M	40	Drug overdose	Found	Skeletal
Homicide	H	M	27	GSW	GSW / car fire	Charred
Homicide	U	F	U	GSW	GSW	Charred
Homicide	U	M	NA	GSW	GSW / House fire	Charred
Homicide	U	F	NA	GSW	GSW / House fire	Charred
Homicide	H	F	24	GSW	GSW	Charred
Homicide	H	M	27	A&SI	House fire	Charred
Homicide	H	M	31	A&SI	House fire	Charred
Homicide	H	M	32	Thermal injuries	House fire	Charred
Homicide	W	F	33	Blunt force trauma	House fire	Charred
Homicide	W	M	36	Stab wounds	House fire	Charred
homicide	H	M	38	GSW	GSW / Car fire	Charred
Homicide	W	F	48	Pending	Car fire	Charred
Homicide	U	M	57	GSW	GSW / House fire	Charred
Homicide	W	F	U	Asphyxia	Strangulation	Decomposing
Homicide	B	F	U	Asphyxia	Strangulation	Decomposing
Homicide	H	M	U	GSW	GSW	Decomposing
Homicide	H	F	NA	GSW	GSW	Decomposing
Homicide	H	F	4	Blunt force trauma	Found	Decomposing
Homicide	W	F	14	Stab wounds	Stabbing	Decomposing
Homicide	W	F	17	Blunt force trauma	Skull fracture	Decomposing
Homicide	B	F	17	GSW	GSW	Decomposing
Homicide	W	F	19	Asphyxia	Strangulation	Decomposing
Homicide	H	M	29	GSW	GSW	Decomposing
Homicide	H	F	30	Blunt force trauma	Auto-pedestrian	Decomposing
Homicide	B	F	45	Blunt force trauma	Found	Decomposing
Homicide	W	M	46	GSW	Found	Decomposing
Homicide	W	F	48	Asphyxia	Strangulation	Decomposing
Homicide	W	M	70	Blunt force trauma	Found	Decomposing

FIG. 1—*Details of the forensic dental identification cases in the Greater Houston Area from January 1998 through October 2000.*

Homicide	W	M	83	Asphyxia	Strangulation	Decomposing
Homicide	B	F	2	Blunt force trauma	Child Abuse	Fresh
Homicide	B	M	4	Lacerated liver	Child abuse	Fresh
Homicide	W	F	20	Asphyxia	Strangulation	Fresh
Homicide	H	F	27	Asphyxia	Strangulation	Fresh
Homicide	W	F	38	Stab wounds	Stabbing	Fresh
Homicide	H	M	39	Stab wounds	Stabbing	Fresh
Homicide	W	F	39	GSW to head	Found	Fresh
Homicide	W	M	56	Stab wounds	Stabbing	Fresh
Homicide	U	M	NA	GSW	GSW	Mangled
Homicide	W	M	26	Blunt force trauma	Beating	Mangled
Homicide	W	M	37	Blunt force trauma	Beating	Mangled
Homicide	W	U	U	GSW	GSW	Mummified
Homicide	W	M	U	GSW	GSW	Skeletal
Homicide	U	M	U	Blunt force trauma	Found	Skeletal
Homicide	W	M	U	GSW	GSW	Skeletal
Homicide	B	M	28	GSW	GSW	Skeletal
Homicide	W	F	37	Undetermined	Found	Skeletal
Homicide	P	F	42	GSW	Welfare check	Skeletal
Homicide	W	F	49	Blunt force trauma	Found	Skeletal
Industrial accident	W	M	45	Thermal injuries	Ind plant fire	Charred
Industrial accident	W	M	24	Blast injury	Industrial plant explosion	Fragmented
Industrial accident	W	M	27	Blast injury	Industrial plant explosion	Fragmented
Industrial accident	W	M	28	Blast injury	Industrial plant explosion	Fragmented
Industrial accident	B	M	32	Blast injury	Industrial plant explosion	Fragmented
Industrial accident	B	M	60	Blast injury	Industrial plant explosion	Fragmented
Industrial accident	B	M	62	Blast injury	Industrial plant explosion	Fragmented
Missing	U	F	NA	Missing	Missing	Missing
Missing	U	M	NA	Missing	Missing	Missing
Missing	U	F	NA	Missing	Missing	Missing
MVA	W	M	32	Blunt force trauma	Car fire	Charred
MVA	U	F	NA	Thermal injuries	Car fire	Charred
MVA	B	F	17	Blunt force trauma	Car fire	Charred
MVA	W	M	18	A&SI	Car fire	Charred
MVA	H	M	19	Thermal injuries	Car fire	Charred
MVA	B	M	19	Thermal injuries	Car fire	Charred
MVA	W	F	20	SI&TB	MVA	Charred
MVA	B	M	20	A&SI	Car fire	Charred
MVA	H	M	21	Thermal injuries	Car fire	Charred
MVA	H	M	22	A&SI	Car fire	Charred
MVA	H	M	22	Blunt force trauma	Car fire	Charred
MVA	H	M	23	SI&TB	MVA	Charred
MVA	B	M	28	Thermal injuries	Car fire	Charred
MVA	W	M	28	Blunt force trauma	Car fire	Charred
MVA	B	M	28	A&SI	Car fire	Charred
MVA	W	M	29	SI&TB	MVA	Charred
MVA	H	M	29	Blunt force trauma	Car fire	Charred
MVA	W	M	30	SI&TB	MVA	Charred
MVA	B	M	30	SI&TB	MVA	Charred
MVA	H	F	30	Thermal injuries	Car fire	Charred
MVA	B	M	34	A&SI	Car fire	Charred
MVA	W	M	36	A&SI	Car fire	Charred
MVA	W	M	37	SI&TB	MVA	Charred
MVA	H	M	38	SI&TB	MVA	Charred
MVA	W	M	40	Blunt force trauma	Car fire	Charred
MVA	W	M	43	A&SI	Car fire	Charred
MVA	W	M	45	Thermal injuries	Car fire	Charred
MVA	W	M	58	Thermal injuries	Car fire	Charred
MVA	W	M	62	Thermal injuries	Car fire	Charred
MVA	H	F	24	Blunt force trauma	MVA	Mangled
Natural	H	M	31	Aneurism	Welfare check	Decomposing
Natural	H	F	35	Diabetes	Welfare check	Decomposing
Natural	W	M	38	Blunt force trauma	Found	Decomposing
Natural	W	M	43	Seizures	Welfare check	Decomposing

FIG. 1—*(continued).*

Natural	W	M	48	ASCVD	Welfare check	Decomposing
Natural	W	M	49	ASCVD	Welfare check	Decomposing
Natural	W	F	55	Anorexia	Welfare check	Decomposing
Natural	W	M	61	ASCVD	Welfare check	Decomposing
Natural	B	M	62	Hypertension	Welfare check	Decomposing
Natural	W	M	73	ASCVD	Welfare check	Decomposing
Natural	W	M	75	ASCVD	Welfare check	Decomposing
Natural	W	M	77	ASCVD	Welfare check	Decomposing
Natural	W	M	79	Alcohol abuse	Welfare check	Decomposing
Natural	B	M	82	Old age	Welfare check	Decomposing
Suicide	W	M	28	Thermal injuries	Self-emulation	Charred
Suicide	W	F	38	Thermal injuries	Self-emulation	Charred
Suicide	W	F	50	Thermal injuries	Self-emulation	Charred
Suicide	U	M	NA	GSW	GSW	Decomposing
Suicide	W	M	26	Asphyxia	Hanging	Decomposing
Suicide	B	F	31	Drowning	Found	Decomposing
Suicide	W	M	47	Asphyxia	Hanging	Decomposing
Suicide	H	F	35	Blunt force trauma	Hit by train	Fragmented
Suicide	W	M	24	GSW	GSW	Skeletal
Suicide	H	M	29	Asphyxia	Hanging	Skeletal
Suicide	B	M	48	Asphyxia	Hanging	Skeletal
Undetermined	W	M	U	Blunt force trauma	Welfare check	Decomposing
Undetermined	W	F	U	Undetermined	Found	Decomposing
Undetermined	W	F	25	Drug overdose	Found	Decomposing
Undetermined	W	M	30	Undetermined	Found	Decomposing
Undetermined	W	M	37	Drug Overdose	Floater	Decomposing
Undetermined	W	F	38	Undetermined	Found	Decomposing
Undetermined	W	M	40	Undetermined	Found	Decomposing
Undetermined	W	F	46	Undetermined	Found	Decomposing
Undetermined	W	F	49	Undetermined	Found	Decomposing
Undetermined	W	M	75	Undetermined	Welfare check	Decomposing
Undetermined	W	M	U	Blunt force trauma	Found	Skeletal
Undetermined	W	F	U	Undetermined	Found	Skeletal
Undetermined	U	U	U	Undetermined	Found	Skeletal
Undetermined	U	U	U	Undetermined	Found	Skeletal
Undetermined	U	U	U	Undetermined	Found	Skeletal
Undetermined	U	U	U	Undetermined	Found	Skeletal
Undetermined	U	U	U	Undetermined	Found	Skeletal
Undetermined	U	U	U	Undetermined	Found	Skeletal
Undetermined	W	F	NA	Undetermined	Found	Skeletal
Undetermined	W	F	U	Undetermined	Found	Skeletal
Undetermined	W	F	12	Undetermined	Found	Skeletal
Undetermined	U	F	35	Undetermined	Found	Skeletal
Undetermined	W	M	58	Undetermined	Found	Skeletal
Undetermined	W	F	16	Undetermined	Undetermined	Skeletal

FIG. 1—*(continued).*

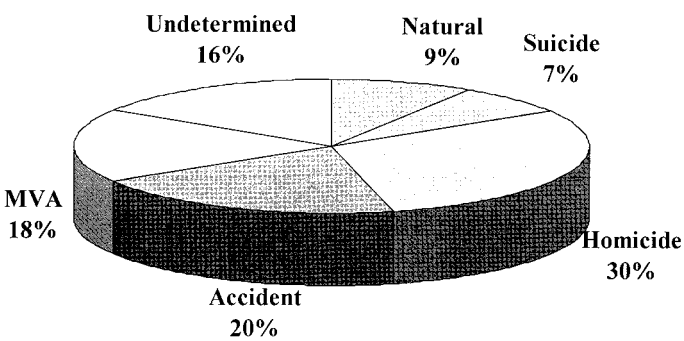

FIG. 2—*Manner of death.*

thermal burn injuries, or a combination of these sustained during car fires and house fires; 23% of the cases involved blunt-force trauma or blast injuries related to plane crashes, industrial accidents, beatings, auto-pedestrian incidents, and train-pedestrian incidents; 18% were related to miscellaneous causes of death, including alcohol abuse or drug overdose, drowning, atherosclerotic cardiovascular disease, stab wounds, falls from high places and assorted medical conditions; 15% of the causes of death remain undetermined; 13% of the individuals died as a result of gun shot wounds; and 7% of the deaths resulted from asphyxia as a result of suicidal hanging or homicidal strangulation. (Fig. 3)

Circumstances Surrounding the Death

The circumstances and situations surrounding each death is often an indication as to whether the identification of the individual will be facilitated by a forensic dental evaluation. Prior knowledge

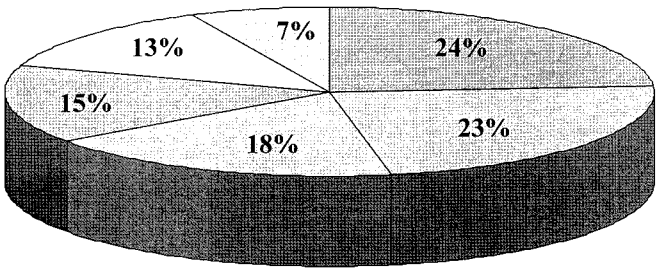

FIG. 3—*Cause of death.*

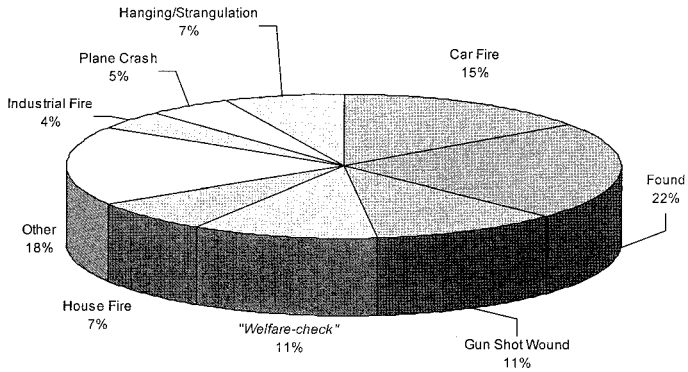

FIG. 4—*Circumstances surrounding the death.*

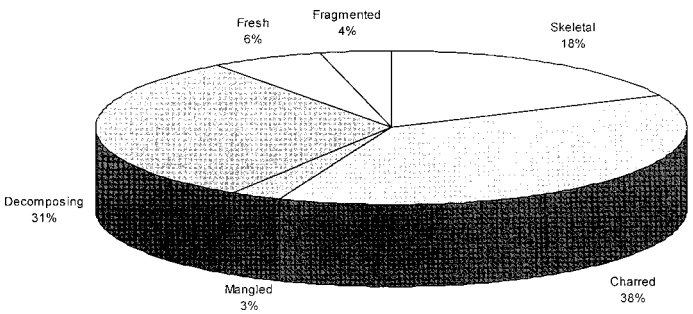

FIG. 5—*Condition of the remains.*

of the incident leading to the death can generally help estimate the damage sustained by the body and help prepare the forensic dentist for the condition of the body to be examined. For example, the victims of car or house fires are frequently burned beyond recognition necessitating the use of dental radiographs and records for comparison. Circumstances that often lead to severe fragmentation of the body or facial regions include plane crashes, beatings, industrial plant explosions, gun shot wounds to the head, auto-pedestrian accidents, and train-pedestrian accidents. The forensic dentist may need to be prepared for strong odors from a decomposing body when the deceased was discovered dead at home as a result of a complaint from neighbors of "a strong or foul odor" emanating from a residence. The commonly used term "welfare-check" refers to a local law enforcement officer going to someone's home to "check on the welfare or well-being" of an individual whose family, neighbors, or co-workers have reported as not having been seen or heard from for several days. Similarly, a decomposed body may be anticipated when the death is the result of a homicide and the body has been wrapped in a blanket or plastic for a long period of time, or when the body has been locked in the trunk of a car during warm weather.

The circumstances surrounding the deaths in this study were classified and ranked in order as follows: 22% of the decedents were found accidentally in unpopulated areas by hunters, children, and construction workers; 18% of the decedents were victims of other miscellaneous situations, including auto-pedestrian accidents, beatings, child abuse, hangings, strangulations, train-pedestrian accidents; 15% involved the dental identification of the victims of car fires; 11% involved gun shot wounds, two of which were the result of suicide with the rest being the result of homicide; 11% of the decedents were found as a result of a "welfare-check" by the police responding to a complaint of a "strong odor" emanating from a residence; 7% of the cases involved house fires; 7% involved hanging victims; 5% involved plane crashes; and 4% involved industrial plant explosions or fires (Fig. 4).

Condition of the Remains

The condition of the remains studied during this retrospective study were classified and ranked in order as follows: 38% were charred or incinerated; 31% were decomposing; 18% were skeletal remains; 6% were "fresh" or recently deceased; 4% were fragmented; and 3% were severely beaten or mangled with displacement of the maxillo-mandibular region, complicating the dental identification procedure (Fig. 5).

The techniques used to gain access to the oral structures during a forensic dental evaluation are determined by the presenting condition of the remains in question. For example, the extent of damage to the fire victim is primarily dependent upon the temperature and length of exposure to the fire. The damage seen in the dental remains of a fire victim can generally be categorized as follows: intact (no damage due to the fire), scorched (superficially parched and discolored), charred (reduced to carbon by incomplete combustion), incinerated (burned to ashes), or burst apart (due to the build up of steam pressure from the extreme heating of the moist pulpal tissues inside the teeth (2).

Decomposing human remains go through the autolysis and putrefaction phases at different rates depending upon several factors such as the temperature and location of the body after death. If a body is discovered quickly after death and has been in a relatively dry and cool environment, the decomposition process may not have progressed very far when the forensic dental evaluation takes place. If, on the other hand, the body was found several days after death and has been in a moist, warm environment, the body may be in a state of advanced decomposition requiring the forensic dentist to clean the oral area of insects, saponification-matter, leaves, or other debris before proceeding with the dental examination. It is not surprising that in the aforementioned states of damage to the dental remains, the successful identification of an individual relies heavily on the quality of the antemortem records presented for comparison (3–5).

Demographic Distribution

The gender of the human remains that required dental identification over the two-year period were classified and ranked in order as follows: 62% were male; 34% were female; and 4% remain undetermined (Fig. 6). The race of the decedents were classified and ranked in order as follows: 55% were Caucasian; 19% were His-

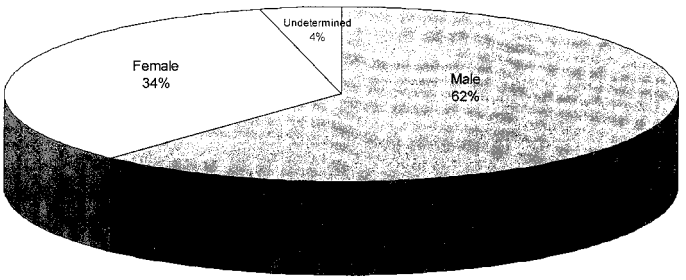

FIG. 6—*Gender of the remains.*

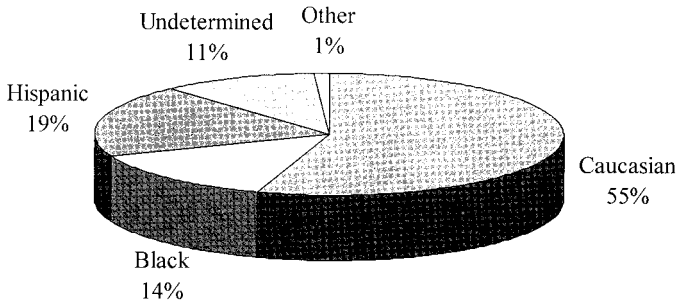

FIG. 7—*Race of the remains.*

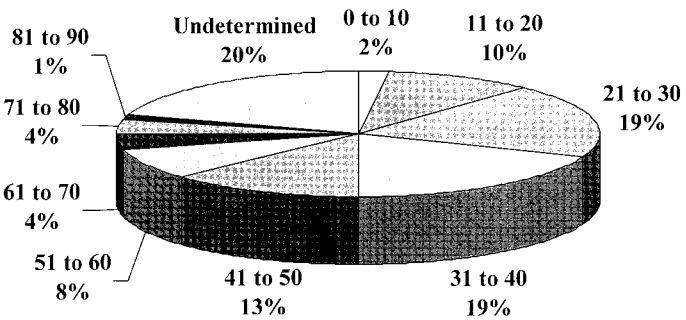

FIG. 8—*Age of the remains.*

panic; 14% were black; 1% were Asian; and 11% remain undetermined (Fig. 7). The age of the human remains were grouped by decade and ranked in order as follows: 2% ranged from 0 to 10 years of age; 9% ranged from 11 to 20; 21% ranged from 21 to 30; 18% ranged from 31 to 40; 13% ranged from 41 to 50; 8% ranged from 51 to 60; 5% ranged from 61 to 70; 4% ranged from 71 to 80; 1% ranged from 81 to 90; while 19% of the decedents remain undetermined with respect to their age (Fig. 8).

Discussion

The forensic dentist generally functions as part of a team of dedicated and talented individuals. Forensic dental identifications in the Greater Houston Area are made possible as a result of the efforts of many dedicated and talented individuals affiliated with the Harris County Medical Examiner's Office. Various individuals gather antemortem dental records, assist during dental autopsies, and communicate with both law enforcement officials, and the families of the decedents. As outlined in this paper, a wide variety of body conditions, circumstances of death, and manners of death will be encountered during the identification of human remains. The forensic dentist must be prepared to examine any of these types of cases and to react appropriately. Further evaluation of these and future dental identification cases will provide valuable data to help prepare the forensic dentist for the wide variety of cases that must be evaluated in the course of their forensic careers.

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