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Forensic Odontology

Dental Identification Problems in the Abu Dhabi Air Accident

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The forensic odontological examination of 112 victims in the 1983 air accident near Abu Dhabi is described with particular reference to the problems encountered in the age assessment of the 26 children, and serves to illustrate that dental identification in aviation accidents may be of only limited application in Asian victims. Following this accident, other means of identification had misguidedly been removed by the recovery teams. Of those identified, half were by dental means alone, but this amounted to only 6.24% of the total number of victims
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On September 23, 1983, a Gulf Air Boeing 737, flight number 771, departed routinely from Karachi en route to the Gulf States. Of the 112 persons on board the aircraft, there were 107 passengers and five crew members. One passenger was a British male resident of Switzerland; the remaining passengers were of Pakistani origin, six of British nationality. The crew consisted of a flight deck crew of Arab origin and two British stewardesses.

After the aircraft had been reported overdue at Abu Dhabi, a search and rescue operation was put into effect. Several hours later, the wreckage was found in the desert between Dubai and Abu Dhabi (Fig. 1). There were no survivors.

Recovery operations were hampered by the desert terrain, bodies being removed to a number of separate mortuaries either by helicopter or by the military and police forces using four-wheel drive and tracked vehicles (Fig. 2).

Gulf Air, in company with a number of the world's airlines, retains a British funeral director specializing in air accident identification and body repatriation for such emergencies. The team arrived from the United Kingdom the next day, accompanied by a British aviation pathologist retained by the airline. The initial team consisted of a team manager; an aviation pathologist; a forensic odontologist; experts in the interpretation of documents, jewelry, and clothing for identification purposes; and embalmers. Once the death toll had been established and the local facilities and problems assessed, it was deemed necessary to increase the number of embalmers from the U.K.

Local assistance was limited to secretarial help and some porterage between the main mortuary and other hospital mortuaries in Abu Dhabi. Within the mortuary itself there was no local professional help—neither medical nor dental.

On receipt of the passenger list, it immediately became apparent that the majority on board were Pakistani. Under the direction of the identification team,

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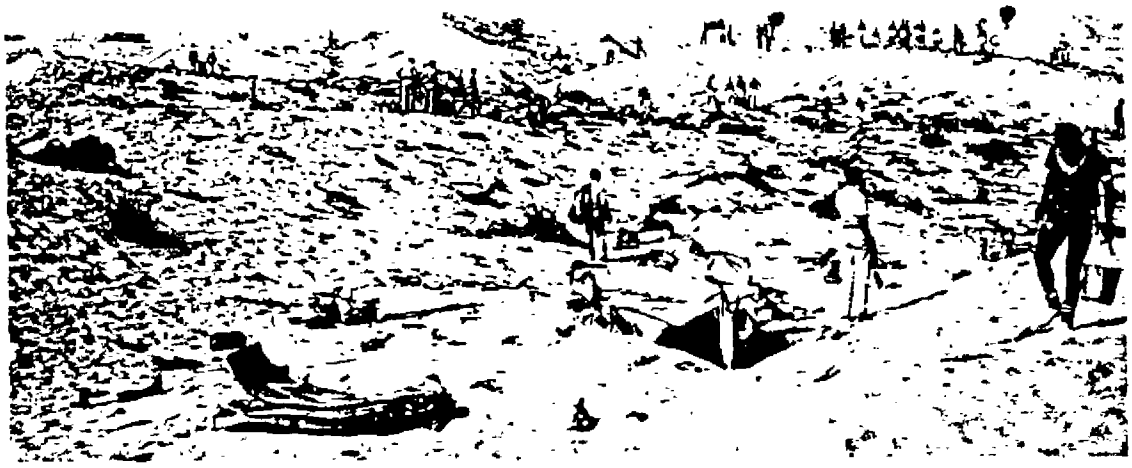

FIG. 1. The crash site.

the airline office in Karachi was designated the ante-mortem information collection centre. Initial difficulties were experienced with the passenger list as family and first names were frequently transposed and the sex of the victim was unclear unless the designations Mr. or Mrs. appeared on the list (Table 1). This situation was resolved by the advice and assistance given by a Pakistani employee of the airline.

The disaster victim identification team established themselves in the main hospital mortuary known to hold the majority of the victims. The exact location of all the recovered remains was unclear for some days due to lack of coordination of the rescue services. Eventually, 129 body bags were located in six separate hospital mortuaries, two of which (Dubai and Al Ain) were several hours by road from the team mortuary (Table 2).

The body bags were found to be unnumbered in refrigerated storage. The accident site had not been mapped with a grid and the position of the bodies had not been recorded before removal. Jewelry, documents, and most of the clothing had been removed prior to the delivery of the bodies to the mortuaries. Identification thus became the major problem for the forensic

FIG. 2. Open truck delivery of bodies to the mortuary.

TABLE 1. *Section of original passenger list and corrected list*

Raja Mohd, Nazir	Nazir, Raja Mohd	Male
Sarwar, Khan	Sarwar, Khan	Male
Mohd, Asgher/Mr	Asgher, Mohd	Male
Ashraf/Nchd	Ashraf, N	M/child
Zaheer, Ahmed/Mr	Zaheer, Ahmed	Male
Ahsanmunir/Mr	Munir, Ahsan	Male
Ghous/Schd	Ghous, S	F/child
Farahusman/Chd	Usman, Farah	F/child
Ashraf/Aınf	Ashraf, A	F/infant

TABLE 2. *Distribution of body bags*

Hospital mortuary		
1	Abu Dhabi	57
2	Abu Dhabi	28
3	Abu Dhabi	10
4	Abu Dhabi	8
5	Al Ain	23
6	Dubai	3
		129

odontologist. It was agreed that the forensic odontologist should work independently of the pathologist, as the time taken for the dental examination was less than for the postmortem examination. On completion of the dental examinations in the main mortuary, the odontologist proceeded to the other mortuaries in Abu Dhabi and then to Al Ain where, on completion of the dental examinations, the bodies were transferred by air to Abu Dhabi for postmortem examination. The three body bags in Dubai were similarly transported. At each of the outlying mortuaries, the odontologist assumed responsibility for opening the body bags and noting any jewelry, documents, or clothing remaining before undertaking the dental examination. Due to the very severe fragmentation of the bodies and the volume of human material and sand in each body bag, considerable time was spent searching for a dentition or fragments of dentition before a routine dental examination could begin.

Each body bag was given a dental number commencing with 500 before being transported to the processing mortuary, where the dental number was cross-referenced to the main numbering system. This caused no complications and ensured that no bag was left unexamined by the odontologist.

ANTEMORTEM DENTAL INFORMATION

There were no dental records available from Pakistan, and no relative was able to name a dentist for any of the victims. Only 11 comments were noted about the dentition on the antemortem forms. Typical comments were "all teeth in good health" or "teeth normal and strong." Two Pakistani families were found to be residents of Britain, and the dental record for the one child who had received dental treatment in Britain was received within 24 hours along with the dental records of the two stewardesses. A day later, the Swiss dental surgeon who had treated the British national resident in Switzerland was traced and his records indicating that extensive bridgework had been carried out were transmitted to Abu Dhabi via London. Dental records of the pilot and copilot were made available by the airline after 5 days. Thus, a total of only six dental records were available for comparison purposes.

RESULTS OF THE POSTMORTEM DENTAL EXAMINATION

The dental examinations were completed in 9 days. The 129 body bags contained 350 pieces of fragmented human remains, no single body having been recovered intact. The oral structures were found in 69 bodies; 57 of these had missing fragments, some with total loss of one arch, either maxillary or mandibular. Of the 12 bodies with intact dentitions, 10 had fractures of the maxilla or mandible. Examination of the remaining bodies revealed no trace of maxilla or mandible, but 19 segments of dental arches were recovered unattached. Few restored teeth were found (Table 3).

This lack of antemortem information from Pakistan was fully appreciated as the postmortem dental examinations progressed. Virtually all the teeth were caries- and restoration-free. The dental record of the British national resident in Switzerland was extensive and there were high hopes of getting a positive primary dental identification. On day 6, the fragmented remains of a white man were examined and identification was made by documents found on his person; the face was missing and no dental structures remained. None of the dental material examined corresponded with any part of the crew records. It was thus not possible to identify any adult victim by dental examination.

AGE ASSESSMENT OF THE 26 CHILDREN

There were 14 girls and 12 boys on board. Information from the relatives gave the ages of the children (Table 4).

TABLE 3. *Restorations found*

Amalgams	34
Synthetics	1
Crowns	2
Dentures (in situ)	1
No. of teeth examined	1,275

TABLE 4. *Ages of the children*

Age range	0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	10–11	11–12	12–13
Girls	2	3	1		4		2	1			1		
Boys			3	1	1	1	3		1		1		1
Total	2	3	4	1	5	1	5	1	1		2		1

As it was found that all the children's teeth examined were caries- and conservation-free—apart from one female child whose age was assessed as 6–7 and one male child whose age was assessed as 11–12—the exact date of birth was examined to determine whether this would be of value in identifying children in the same age group. Identification by dental age exclusion was made more difficult by the fact that 11 relatives did not know the exact birth date but only the year (Table 5).

Of the boys, three in both the 2–3 and 6–7 year age ranges could not be identified by dental age. In the 2–3 group, none had a birth date and individual age assessment could not lead to a primary dental identification. In the 6–7 age group, two had known ages of 6 years, 1 month and 6 years, 11 months, but identification was impossible as the exact age of the third child was unknown. This also applied to the girls in the 1–2 and 4–5 age groups.

POSTMORTEM EXAMINATION OF THE CHILDREN

The severely mutilated remains of 25 children were recovered: 12 boys, 12 girls, and one impossible to sex. Four boys, two girls, and one unsexed were decapitated or had no remaining dental structures. In these cases, age assessment was based on anthropological measurements by the pathologist.

The dental tissues of the 18 children whose ages were considered possible to assess were in many cases incomplete.

One dental chart for a girl aged 6 who had lived in the U K. was available. Two girls in this age range were known to be on this flight (Table 4), and two of the female bodies matched this age One was identified by comparison with the antemortem record of the girl aged 6 who had lived in Britain, the second by dental age exclusion. Neither of these children could have been identified if one had not received dental treatment.

Two girls below the age of 1 year were 3 and 9 months old, respectively. A positive identification was made on both by visual examination of the teeth in their crypts. There were no radiographic facilities available to assist in the age assessment procedure.

In the 2–3 year age group there was one girl aged 2 years, 11 months Identification was confirmed by medical and dental age assessment, as there was no girl in the 3–4 group. The boy and girl in the 10–11 age group were similarly identified.

Further positive identifications by dental age were not possible because there was insufficient dental material or there was more than one child of the same age group and sex. The only restorations found in the children were two amalgams in the 6-year-old child who lived in the U K. and one amalgam in the boy whose age was assessed as 10–11.

Dental identification was the primary means of identifying seven children; six adults were identified by documents and one by jewelry. These items had been missed by the rescue teams. Although dental identification resulted in half of the total identified, it amounted to only 6.24% of the total number of victims.

DISCUSSION

There is extensive literature referring to the importance of identification of people involved in aircraft accidents from their dental records. Stevens and Tarlton (1) stated that the use of dental evidence does have its limitations. The remains are often fragmented, resulting in the recovery of only a small portion of jaw bearing teeth which is representative of an individual. This was clearly demonstrated in Abu Dhabi. In cases in which dental data are inadequately recorded or the

TABLE 5. *Identification by birth dates/year only*

		0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	10–11	11–12	12–13
Birth date	M				1	1	1	2		1		1		
known	F	2	2	1		1		1				1		
Year only	M			3				1						1
known	F		1			3		1	1					

population has an almost nonexistent caries rate, dental identification will be of limited application—dental identification can only be as good as the antemortem records. With the decreasing incidence of caries and the necessity for fewer restorations in Western children, it can be expected that similar problems of identification will occur in the Western hemisphere in a few years. It is reasonable to assume, therefore, that age assessment methods, particularly for young victims, will gain increasing importance.

Ashley (2) noted that in the 47 Asian victims of the 1969 Gatwick air accident there were only five restorations, whereas the three European victims had 50 restorations. It was proposed to undertake age assessment in the Abu Dhabi accident by the method described by Ashley. However, due to the severe fragmentation of the bodies it was impossible to remove a series of teeth from each child. The method assumes that the exact age of the victims in any one age group is known. It might have been possible to use this technique for establishing the oldest and youngest child in any one age group, but this method should be used with extreme caution—bearing in mind the wide variations in eruption patterns observed in Western children—and is possibly best used as a secondary means of identification. Ashley encountered similar problems in the Gatwick accident, but there were other means of identification available.

Unfortunately, in the Abu Dhabi accident, virtually no means of identification remained other than dental examination. Those identified by documents and one by jewelry must have had these items overlooked by the recovery teams, who misguidedly collected all the belongings from the remains.

The problems of accident investigation in disasters abroad have been noted elsewhere (3). The usefulness of dental identification procedures varies greatly with the race of the passengers on the aircraft. In races with minimal or no caries, no dental restorative work, and therefore little in the way of dental records, or in those who have ample restorations but for whom records are not kept, dental identification will play an insignificant part (4,5).

The importance of the place of residence in victims of the same race was observed in the Air India Boeing 747 disaster off the coast of Ireland in 1985. The majority of passengers were of Indian origin, and those residing permanently in Canada had excellent antemortem dental records, whereas those residing permanently in India did not.

In the Abu Dhabi accident, we were under extreme pressure to complete the work in order to comply with the observances of the Muslim and Hindu religions. The deadline for the mass funeral had to be postponed several times, and the team leader was often occupied in negotiating time extensions on our behalf.

Although it took 9 days to complete the dental examinations, this was not unreasonable considering the working conditions, travel time between mortuaries, and the oppressive heat. With the exception of Al Ain, where an American dental surgeon undertook the writing of the charts, all the paperwork involved in recording the dentition had to be undertaken by the examining dental surgeon.

The lack of suitable radiographic equipment is a constant problem at disaster sites; in this particular accident, radiography of each body bag would have speeded up the detection of dental structures and contributed significantly to age assessment in the children.

The necessity for being self-supporting was clearly demonstrable following this accident, as was noted by the Dutch team following the Tenerife accident (6). J. H. Kenyon, the U.K.-based funeral directors who are retained by a number of the world's airlines as their specialists in air accident victim identification and repatriation, shipped out 2½ tons of equipment by air—including all the necessary stationery as well as equipment for forensic, medical, and dental examinations; embalming; and casketing. Forensic odontologists from The London Hospital Medical College are attached to this experienced team, whose members have worked on 90 major air accidents involving 3,750 victims. □

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REFERENCES

1. Stevens PJ, Tarlton SW. Medical investigation in fatal aircraft accidents. *Br Dent J* 1966;120:263–70.
2. Ashley KF. Identification of children in a mass disaster by estimation of dental age. *Br Dent J* 1970;129:167–9.
3. Stevens PJ. Practical problems arising in the investigation of airline disasters abroad. *Aerospace Med* 1965;7:641–6.
4. Haines DH. Dental identification in air accidents. *J Forensic Sci Soc* 1974;14:225–8.
5. Pert DI. Dental aspects of the Mt. Erebus disaster. *N Z Dent J* 1980;10:187–93.
6. van den Bos A. Mass identification: a multidisciplinary operation. *Am J Forensic Med Pathol* 1980;1:265–70.