BRIGHTON POLYTECHNIC

Faculty of Health

Department of Podiatry

B. Sc. Honours Degree
in
Chiropody

Title: The Potential of Chiropody Records in Forensic and Mass Disaster Identification

Author: Denis Wesley Vernon

October 1990

THE POTENTIAL OF CHIROPODY RECORDS IN FORENSIC AND MASS DISASTER IDENTIFICATION

Denis Wesley Vernon

Bachelor of Science (Honours) Degree in Chiropody

Department of Podiatry

Brighton Polytechnic - 1990

ABSTRACT

It is suggested that identification from chiropody records should be included in the repertoire of standard identification techniques. The importance of identity and how identity can be lost are given, and standard identification techniques and their limitations reviewed. Past involvement of Chiropody/Podiatry in forensic science is examined and its' neglect highlighted.

The current taught systems of chiropody notation are discussed, and to demonstrate that identification from chiropody records is viable, the probable percentage of individuals receiving chiropody treatment in the U.K. is statistically suggested as between 4.692% and 7.277% of the population.

A random selection of 300 record cards was examined for individuality of chiropodial lesion patterns, and short-term identity at least was shown to be represented by such patterns.

The success rates of ten Chiropodists undertaking identification judgements on unidentified NHS chiropody patterns were examined. Two tests were used. Test 1 - simulating identification of one individual in isolation. Test 2 - where an individual requires identification from five possibilities.

Two different Health Authorities were involved (five Chiropodists from each), and the tests were conducted in three different situations:

1. Using the testing chiropodists own notes.
2. Using a nominated chiropodists notes.
3. Using notes made by chiropodists taken at random.

One District showed significantly greater success in identification than the other, probably due to a combination of different record-keeping standards and pathology differences for socio-economic reasons. Identification from ones own notes was significantly better than from anothers notes in Test 1, but not in Test 2. One Chiropodist identified with significantly greater success, and one with significantly less success than the others in one District, but may have been due to protocol deviations. Identification in Tests 1 and 2 were equally successful, and the testing of random notes showed that similar success would be expected in practice. 85.65% of identification judgements were correct. This rate, while high, could be improved by a standardized notation system, improved care in recording treatment details, and use of an identification strength scale in practice.

It is concluded that identification from chiropody records can be useful to Forensic Science, with a Podiatrist attached to the identification team, consulting chiropodists who made relevant notes where necessary, and its' use as a standard technique is recommended.

ACKNOWLEDGEMENTS

Brighton Polytechnic:

Mr M Whiting, Personal Tutor and Head of School

Mr M Potter, Course Leader

Mr I Birch, 1st year Supervisor

Sheffield District Health Authority:

Mrs L Blank, District Chief Chiropodist

Mr I Atkinson, Senior Chiropodist

Mr J Walker, Senior Chiropodist

Mr A Ward, Senior Chiropodist

Mr K Shaw, Divisional Chief Chiropodist

Mr A Fidler, Appliance Technician

Brighton District Health Authority:

Mr J Basket, District Chief Chiropodist

Ms K Patel, Chief Chiropodist

Ms C Hewetson, Senior Chiropodist

Mr R Cruse, Senior Chiropodist

Mr M Clark, Senior Chiropodist

Ms S Howell, Senior Chiropodist

Sheffield University Medical and Dental Library:

Mr M Lewis

Mr J Clark

Ms J Hall

Ms D Marriott

Ms P Brown

Ms H Needham

Ms A Litton

Heads of Schools of Chiropody

Participating Private Practitioners

Participating NHS Patients

Secretary of the Society of Chiropodists: Mr J Trouncer

Professor A Usher

Dr I E Doney

Personnel:

Mr M Bond

Mrs J Stacey

Mrs V Vernon

Typist: Mrs C Bagshaw

Graphics Unit, Medical Illustration: Mr A Brown

This research project would not have been possible without considerable help and assistance from the above named (and un-named) individuals.

Grateful thanks must be offered to the named members of Brighton Polytechnic, Department of Podiatry staff for their invaluable guidance, help, experience, support, dedication and enthusiasm throughout the project.

To Mrs L Blank of the Sheffield District Health Authority for allowing the data collection to take place, and the named staff members for their hard work and support in collecting data and distributing questionnaires.

To Mr J Basket of the Brighton District Health Authority for similarly allowing data collection to take place, and the named staff members for hard work in collecting data.

To the named staff of the Sheffield University Medical and Dental library for invaluable assistance in finding and obtaining references.

To the Heads of Schools of Chiropody, participating private practices, Secretary of the Society of Chiropodists and participating NHS patients for replying to correspondence, and giving information where required, without which the project could not have taken place.

To Professor A Usher and Dr I E Doney for 'fuelling enthusiasm'.

To Mr M Bond for many hours of babysitting.

To Mrs J Stacey for meals and accommodation.

To Mrs V Vernon for help, support and translations.

To Mrs C Bagshaw for typing this project.

CONTENTS

Page

Abstract 2

Acknowledgements 4

Contents 7

List of Tables 11

List of Illustrations 12

1. Introduction

1.1 The importance of identity, and why loss of identity must be restored 13

1.2 How identity is lost 14

1.3 The process of identification 17

1.4 Standard methods of identification

1.4.1 Forensic Odontology 19

1.4.2 Fingerprints 23

1.4.3 X-Rays 24

1.4.4 Personal Effects 26

1.5 The past use of Chiropody and the foot in identification 27

1.6 The purpose and history of Chiropody records and their relevance to identification 35

1.7 Project Aim 36

2. Examination of Notation Currently Taught in the Recognized Schools of Chiropody in the U.K.

2.1 Method and methodology 37

2.2 Results 37

3. Determination of Approximate Numbers of the Population who Currently Receive Chiropody Treatment in the U.K.

3.1 Method and methodology 41

3.2 Ethical considerations 43

3.3 Results 44

4. To Ascertain Whether Chiropody Records Demonstrate Adequate Differentiation for an Individual Identification to be Made

4.1 Method and methodology 50

4.2 Ethical considerations 52

4.3 Results 53

5. Determination of Whether a Chiropodist can, in Practice use Chiropody Treatment Records to Give an Indicative Identification of an Individual

5.1 Pilot Test

5.1.1 Method and methodology 57

Ethical considerations 58

Results 59

5.2 Controlled Tests 60

5.2.1 Method and methodology 61

5.2.2 Ethical considerations 66

5.2.3 Results 75

6. Discussion 94

7. Conclusions

References 99

Bibliography 106

Appendix 1 121

Appendix 2 123

Appendix 3 124

Appendix 4 125

Appendix 5 126

Appendix 6 128

Appendix 7 129

Appendix 8 130

Appendix 9 131

Appendix 10 132

Appendix 11 133

Appendix 12 134

Appendix 13 135

Appendix 14 136

Appendix 15 137

Appendix 16 140

Appendix 17 141

Appendix 18 142

Appendix 19 143

Appendix 20 144

Appendix 21 146

Appendix 22 147

Appendix 23 149

Appendix 24 151

Appendix 25 153

Appendix 26 155

Appendix 27 157

Appendix 28 159

Appendix 29 160

Appendix 30 162

LIST OF TABLES

Table		Page
1	Major catastrophes in the U.S.A., 1977-1981	16
2	Potential problems that may hinder or prevent identification with respect to current methods used	28
3	The number of different chiropodial conditions/ situations abbreviated in the respective subject areas	39
4	Taught chiropodial abbreviations representing different meanings	40
5	Numbers of patients attending individual private practices	45
6	Lognormal distribution of numbers of patients attending individual private practices	46
7	Results of NHS patient questionaire	48
8	Population of the U.K.	54
9	Social classes of England and Wales	55
10	Lesion patterns observed more than once in a sample of 300 treatment record cards	56
11	Proportions of subjects correctly identified/eliminated by judgement	67
12	Reasons given for failure to identify/eliminate by judgement	68
13	Mortality Statisftics 1989, Sheffield DHA	84

LIST OF ILLUSTRATIONS

Diagram

1 Robbins' foot measurement landmarks 30

2 Algorithm of the decision making process a Chiropodist would undertake in identification 93

INTRODUCTION

The importance of identity and why loss of identity must be restored.

In modern society, ordinary citizens accept certain personal responsibilities. In return, society guarantees fundamental personal and civil rights. These facts constitute the major reason why every citizen must retain personal identity throughout life and beyond death (Keiser-Neilson S, p.1). Personal identity is formed from infinite combinations of physical and mental features, none of which in isolation can be seen as individual. By law, minimum non-physical data is recorded for everyone on birth certificates, representing social identity. Death certificates officially record death. They are important legal documents and until issued, individuals must be considered alive and entitled to full protection of personal and social rights. Because of this, serious legal complications are created when a person is missing. Such complications involve settlement of estates, insurance awards, ascertainment that no foul play is involved, and the possibility of bigamy (Riesner N R, p.74). Where the unknown supports a family, financial burden may be placed on that family until officially pronounced dead. In such cases, verdicts of 'Assumed Death' replace death certificates, but a period of one to ten years may be stipulated before an application for this verdict can be made. Every body recovered belongs to someone missing, so in orderly society, every human body recovered must be

identified as quickly as possible (Keiser-Neilson S, p.2).

Person Identification is used to match data of an unknown body with a known missing person. When Authorities are satisfied of a match, death certificates are issued and identity re-established. Recognition by next of kin is the standard procedure, though can give wrong identification. Clothing and pocket contents are used, but still subject to error. Identification is thus relying more on body features. Forensic Examiners therefore look for general features (e.g. eye and hair colour, etc.) and specific physical features (e.g. scars, moles, etc.) to establish identity. This matching of data has reached levels of excellence in the Federal Bureau of Investigation (F.B.I.), through Unidentified/Missing Person files offering computer comparison of descriptive data on unidentified persons, with data entered on missing persons (Fierro M F, p.349).

<u>How identity is lost</u>.

Loss of identity may be due to bodies being unknown or undiscovered for some time, or having essential features destroyed by putrefaction, decomposition, or trauma. Traumatic loss of identity is most common in mass disasters with widespread loss of life. Aircraft accidents typify such disasters, as seen for example in 1979, when an airliner crashed on Mount Erebus, Antarctica, killing the 257 people on board (Cairns F J et al). Aircraft accidents constitute the major cause of mass disasters, with natural

causes, failure of man-made artifacts, fires and shipping accidents being other major catastrophes, with widespread loss of life.

From 1977-1981 in the United States of America (U.S.A.), there were 24 incidents with over 25 deaths, totalling 1,609 fatalities (Stat. Bull. Metrop. Life Ins. Co.). Four of these incidents involved aircraft and accounted for 517 lost lives, nearly a third of all lives lost in these disasters (Table 1).

Mean loss of life in aircraft accidents is greater than other disasters. The scale of aircraft disasters is such that a firm of funeral directors, J H Kenyons, is retained by the world's airlines as specialists in air accident victim identification and repatriation, and up to 1986 had worked on 90 major air accidents involving 3,750 victims (Clark D H, p.321).

Although loss of identity is usually seen in accidents and mass disasters, it can also be caused deliberately. To avoid incrimination, murderers may conceal a victim's identity by deliberate mutilation, including decapitation, and disarticulation of hands and fingers to avoid recognition of the victim. Such a case occurred in 1982, whereby two legs and arms with disarticulated thumbs and fingers were recovered (Schneider V et al). From 1959 to

Table : 1
Major catastrophes in the U.S.A, 1977-1981

Category	Total lives lost	No. incidents	Mean loss of life per incident
Aircraft accidents	517	4	129.25
Natural causes	446	9	49.55
Failure of man-made artifacts	300	4	75
Fires	306	4	76.5
Ships	100	3	33.33

1987, in Germany, 31 criminal dismemberment and mutilation cases were investigated, of which 12 were defensive (i.e. to prevent association with the perpetrator) (Puschel K and Koops E). Such cases occurred in one in five hundred legal autopsies and were increasing, with six dismembered victims in 1984 alone.

Loss of identity can also be deliberate in suicide cases, whereby possibly to save families from distress, victims undertake bizarre measures to conceal personal identity. In 1990, such a case is described, whereby an unknown man who hung himself had cut labels from his clothing prior to the suicide to prevent identification (Buxton Advertiser, p.1).

The Process of Identification

The simplest method available is used to re-establish identity, usually next of kin recognition. Wrong identification by this method has occurred in the past (Keiser-Neilson S, p.1), which can also distress relatives. Furthermore, there is reliance on facial features being recognizable. Where such features are irrecognizable, clothing and pocket contents could indicate identity, but are subject to error, especially where labels are non-existent or destroyed. In crime, clothing may be removed, or anothers clothing substituted to mislead investigations. Where simplistic methods are unsuitable, scientific body identification is used, and exists in two forms -

identification of single persons, and identification of multiple victims. Single person identification is undertaken by forensic investigators, who collate post-mortem data, comparing it with ante-mortem records, from missing person files, or at-risk population data.

Multiple person identification is more complex, being undertaken by teams at disaster sites. Teams often find traumatic loss of identifying features from disaster effects, thus requiring many ante-mortem records to attempt a match with the victims, a situation which may be complicated by inaccurate and incomplete ante-mortem records. The identification process is:

Preliminary analysis
Data collection
Data analysis
Final verification of identity

Preliminary analysis is situation assessment, data collection is transmittal, organisation and collation of known and unknown records into similar forms. Data analysis is comparison and selection of records that fit loose qualification indices for the unknown, and final verification is the finding of a successful match.

Identification may be positive, where an exact match occurs, or by exclusion whereby data cannot possibly match,

and a limited number of victims are available, hence that victim being named by exclusion. This is subject to inaccuracy (e.g. when missing person lists are incorrect).

Identification teams consist of Dentists, X-Ray Personnel, Fingerprint Experts, and Personal Possessions Experts. In the 1982 International Disaster Identification Report (Van den Bos A, p.63), it was recommended that teams should contain police, medical, dental and other experts, with the medical field being forensic pathologists, forensic odontologists, radiologists and anthropologists.

Standard Methods of Identification

Forensic Odontology

Forensic Odontology is the most successful identification method. It is based on no two dentitions being alike. Adult dentition has 32 teeth, each with five surfaces, giving 160 different oral cavity surfaces. Pathologies affecting teeth give over 2.5 billion different possibilities in dentition (Moore D, p.134). Of 212 Americans killed in a 1977 air collision, 187 were positively identified by dental comparison, which was the sole identification method for 156 victims (Wolcott J H and Hanson C A, p.1034). Similarly, in a 1979 plane crash, of 224 bodies, 142 were identified by dental means (Pert D I, p.192). In the Green River Serial Murders between 1982 and 1986, Forensic Odontologists identified 27 victims out of 36 (Haglund et al, p.1669). These incidents illustrate the

success of dental identification.

History

Forensic Odontology implies using dental knowledge to assist the law, including identification by examination of dental remains, examination of bite marks, and dental jurisprudence (Moore D, p.133). The first identification by dental remains occurred in 1776, whereby an American General was identified from a dental bridge (Ring M E, p.562). Dental identification however, was only accepted in 1949, when a ship burned in Toronto harbour (Ring M E, p.559). One hundred and fifty three burned bodies were recovered and identified by dentists. Procedures used formed the basis of modern forensic odontology techniques.

Techniques

Forensic Odontology utilizes dental restorations, bone trabecular patterns, prosthetic appliances and dental morphology in identification. High individuality is represented, so considering all variations, dental identification is highly probable if ante-mortem records exist. Several features contribute to the success of dental identification, which ranks second only to fingerprint identification in accuracy (Riesner N R and Wooldridge E D, p.74). Most people have dental records, while few have fingerprint records in the U.K. Dental evidence is specific, stable and endurable. Additionally, the soft tissue of the mouth insulates teeth from traumatic and burn damage.

Dental identification involves collection of ante-mortem records, transcription of these into specifically coded odontograms, comparison with post-mortem odontograms and final report submission.

Problems in Dental Identification

Despite the supremacy of forensic odontology, obstacles to successful identification occur. The first problem concerns the availability and condition of dental material. Traumatic effects may destroy feature. If trauma causes decapitation, or gross head disruption, dental evidence is lost. Similarly, in criminal decapitation, dental evidence is lost. Traumatic head damage may cause partial loss of dental material, hindering or preventing identification. Such damage includes tissue disintegration, or simple loss of teeth.

Another problem is with regard to edentulous victims, with no dental material available. A method has been suggested using denture surface anatomy in identification, casting the victims dentures and comparing with a spare set (Jacob R F K and Shalla C L). For 100% accuracy, evaluation of the entire dental cast and victims spare dentures are required. The victims dentures must be intact - not necessarily the case following trauma. For self-protection, criminals may destroy victims dentures. This method may therefore be limited in identification.

Dental identification problems also occur with ante-mortem data, which may not be available. In the U.K., this should rarely happen, but other countries dental services may be inextensive. This problem occurred in a 1983 air crash, where only 6.24% of victims were identified from dental records for this reason (Clark D H). Assuming that records are available, record quality can also give problems. Dental chartings can vary, with poor abbreviations, poor handwriting and errors obstructing identification. In the U.K., only work to be done and actually done must be recorded (Hill I R, p.215), so to fully evaluate dental status, several charts may have to be combined. Inconsistencies may occur. In one disaster, 32% of records involved contained errors (Hill I R, p.216).

Uncommon nowadays due to high quality forensic odontology, but still possible, are errors in post-mortem examination and recording. To reduce this error, it is now common practice for two dentists to undertake the examination and compare notes.

Consequences of such an error may be far-reaching as in the Albury Pyjama Girl case, where conviction of the miscreant was delayed by several years by a post-mortem recording mistake (Brown K A).

A final challenge to dental identification is the improvement in Western dental health from health education

and public measures (e.g. fluoridation of water). Improvement in dental caries and restorations reduces dentition individuality, forcing more complex and costly identification systems, detracting from the simplicity of present dental identification.

Fingerprint Identification

This major means of identification involves comparison of victims fingerprints with recorded prints made in life. This is the most accurate identification method (Riesner N R and Woolridge E D, p.74). In addition to success in criminal identification, fingerprinting has achieved disaster identification success. Between 1959 and 1980, the F.B.I. Disaster Squad identified 3,209 disaster victims by fingerprinting, i.e. 62.85% of victims requiring identification (Leapley F M, p.1016).

Advantages

Individual prints are considered unique, rendering them the most accurate method of demonstrating individuality. Little relevant body tissue is required, so fingerprints are suitable where gross body disruption has occurred. Fingerprinting provides irrefutable results quickly.

This method is particularly useful in the U.S.A., where fingerprinting is extensively practised for employment applications, obtaining weapons, or for personal identification. In 1980, the F.B.I. retained files of over

64 million fingerprints, 22 million of criminals, the rest for civil purposes (Leapley F M, p.1016).

Disadvantages

Where ante-mortem fingerprint records don't exist, fingerprinting cannot be used. Although used extensively in America, other countries use fingerprinting for criminal purposes only, thus limiting its' use. Fingerprinting is well known, therefore criminals may be aware of the need to mutilate fingers to prevent identification (e.g. in the 1982 finding of dismembered body parts, where the fingers were meticulously disarticulated by the assailant) (Schneider V et al).

Fingerprints are soft tissue features and easily obliterated, especially as hands are usually unprotected. They would also be destroyed by putrefaction in an undiscovered body.

X-Rays

Radiographic screening of bodies for surgical artifacts, personal effects and foreign bodies for identification is well established (Lichtenstein J E et al, p.1004), to uncover evidence for primary identification. Radiographic comparison of ante-mortem and post-mortem radiographs is also a means of identification.