A 'Zonal' Approach to Fibre Mapping

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1.Abstract

'Fibre Mapping' refers to the ability to confidently describe the distribution of transferred extraneous fibres on the clothing or body of a person, in order to try and elucidate the nature of the contact causing the transfer.

In the majority of laboratory situations, it is not possible to infer with any degree of confidence where on a garment the primary contact between two textile items occurred. This is due to a number of factors e.g.; the recipient may have been actively wearing the garment for sometime afterwards, the recipient garments once seized are usually folded and then packed into a bag for submission to the laboratory. Both these situations result in a redistribution of fibres from the primary contact site making any resultant 'mapping' problematical.

The process of fibre mapping is often used synonymously with the term 1:1 taping; however, this is incorrect as 1:1 taping is simply *one* method of fibre recovery which allows a 'distribution map' to be made. This paper describes and advocates an alternative method of fibre recovery also conducive to fibre mapping – *'zonal taping'*

2. Introduction

The technique of 1:1 taping originally proposed by Neubert-Kirfel [1] provides a means of fibre recovery from the crime scene which would allow precise mapping of the fibre distribution on the victim (*provided that the body has been undisturbed, and not deposited from the original murder site*). This method involves sequentially laying strips of adhesive tape over the entire exposed surface, each strip being uniquely numbered. Once this is done, the body is photographed and/ or notes taken so that each strip can be attributed to a specific region of the body. Once removed, the strips are searched for the presence of target fibres and any present can be associated with the area in question. A detailed distribution map can therefore be built up. Such a map can in some circumstances provide useful corroborative evidence when a specific scenario of contact between the victim and their assailant is postulated or needs to be established.

This method has been applied in mainland Europe notably by Nehse [2] and recently in the UK by Coyle [3]. Whilst both these authors promote the value of this method, they also concede that uptake by the majority of practitioners has been poor, mainly due to the burden which it places both on crime scene examiners and laboratory staff in terms the resources at the scene and in the laboratory due to the sheer number of tapings produced (typically equivalent to an area of $2m^2$) which have to be ultimately searched [2, 3, 4].

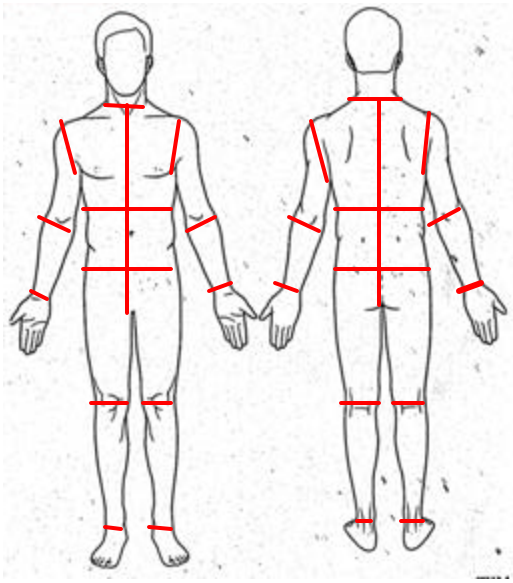
Given that not all cases will depend upon fibre evidence and in those that do, only a small proportion are likely to gain added value from this approach, it is easy to see why many regard this method impractical as a standard operating procedure.

Whilst there is no doubt that true 1:1 taping at scenes can produce highly detailed maps of fibre distribution, there is a question over whether this level of detail and the resources required are completely necessary. Stauber [5] addressed this issue and proposed an 'areal' method of fibre recovery which would still allow fibre mapping to be performed. The Forensic Science Service has adopted a very similar approach which we refer to as 'Zonal' taping. It is our belief and experience that this method can produce a map of fibre distribution which although less detailed than 1:1 taping, is a more pragmatic 'fit for purpose' approach and *much less resource intensive* at the scene and in the laboratory.

Given that good practice dictates that surface debris should be recovered at the crime scene, we propose that the victims body should be taped in a systematic and consistent manner using defined 'zones' [Figure 1]. The surface debris tapings should be taken in the standard manner with the number of tapings per zone dependent upon the nature of the recipient surface (i.e. preventing tape overloading).

The tapes should then be labelled according to the zone from which they were recovered.

Figure 1.



4. Experimental

In order to demonstrate the value of this approach, we performed the following experiments:

Experiment 1.

A simulated attack was performed with the 'assailant' wearing a fluorescently dyed jumper which readily shed its constituent fibres. The assailant approached the victim from behind and placed him in a head/ throat lock during which the victim struggled [Figure 2].

Figure 2.

The victim then 'fell' to the floor on his back and lay as still as possible. 1:1 taping was then carried out, using 4cm wide, clear adhesive tape. The victim was then turned over keeping his position as still as possible and his back surfaces were also 1:1 taped. A '1:1 fibre map' similar to that reported by Coyle [3] was produced.

130 tapings were produced in total.

In order to produce a 'Zonal Map', the number of target fibres on each of the 1:1 tapings which fell within our proposed zones was summated. The total number of target fibres for each zone was then used to produce a map which would have resulted had the tapings been taken in the zonal manner we proposed.

Experiment 2.

In the second experiment, the assailant wore a T shirt and pair of jeans each of which were dyed distinctively to aid subsequent tape lift searching. The sheddability of these garments was much less than in the first experiment and more realistic as a casework example.

The 'assailant' to straddle the 'victim' (who lay on the floor) and to simulate strangling him. This activity continued for 1 minute during which time the 'victim' was instructed to try to push the 'assailants' hands away. After 1 minute, the 'victim' lay still and the 'assailant' moved away. The 'victim' was then 'zonally' taped on his front and back using 2cm wide, clear adhesive tape.

33 tapings were produced in total.

These tapes were searched and a distribution map of the fibres relating to the t-shirt and jeans of the 'assailant' on the victim was prepared.

Figure 3.

5. Results

Experiment 1

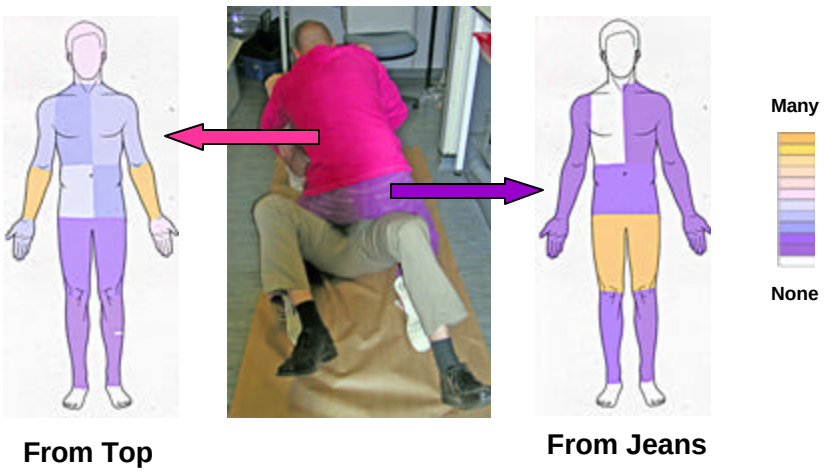
The maps produced by these methods are in appended [Appendices 1-4] and can be compared against each other *and the nature of the activity resulting in the transfer*. It can be seen that although the highly sheddable nature of the target garment has to a certain extent saturated the tapings, the maps produced by each of the methods allows the same conclusions as to the nature of the contact to be drawn.

Experiment 2

A summary of the findings is presented in figure 4. Since comparatively few fibres were found on the back of the victim, the maps relating to the front are presented. Note that the absolute numbers of fibres in each zone are largely irrelevant, the relative numbers being the important issue.

It should also be noted that these maps have been presented 'blind' to numerous fibre practitioners in the UK and Europe and the majority have correctly deduced the nature of the assailant-victim contact.

Figure 4.



6. Discussion

Whilst both these experiments are unsophisticated, they nevertheless illustrate that fibre mapping can provide a means of elucidating the nature of the contact producing the resultant transfer.

It can be also be seen that whilst the fibre maps produced by the '1:1 taping' method provide an ostensibly greater degree of resolution than the zonal method, the apparently greater degree of resolution is somewhat superfluous in that deduction is also possible from the 'zonal map'.

In other words, the same conclusion can be reached using both methods – however the 'zonal' method is much less resource intensive at the scene and in the laboratory.

It may also be argued that at a scene, small numbers of fibres can still be redistributed as a consequence of the examination and therefore the degree of resolution afforded by 1:1 taping could to a certain extent, be misleading.

7. Conclusion

The advantages of the 'zonal' taping method are as follows:

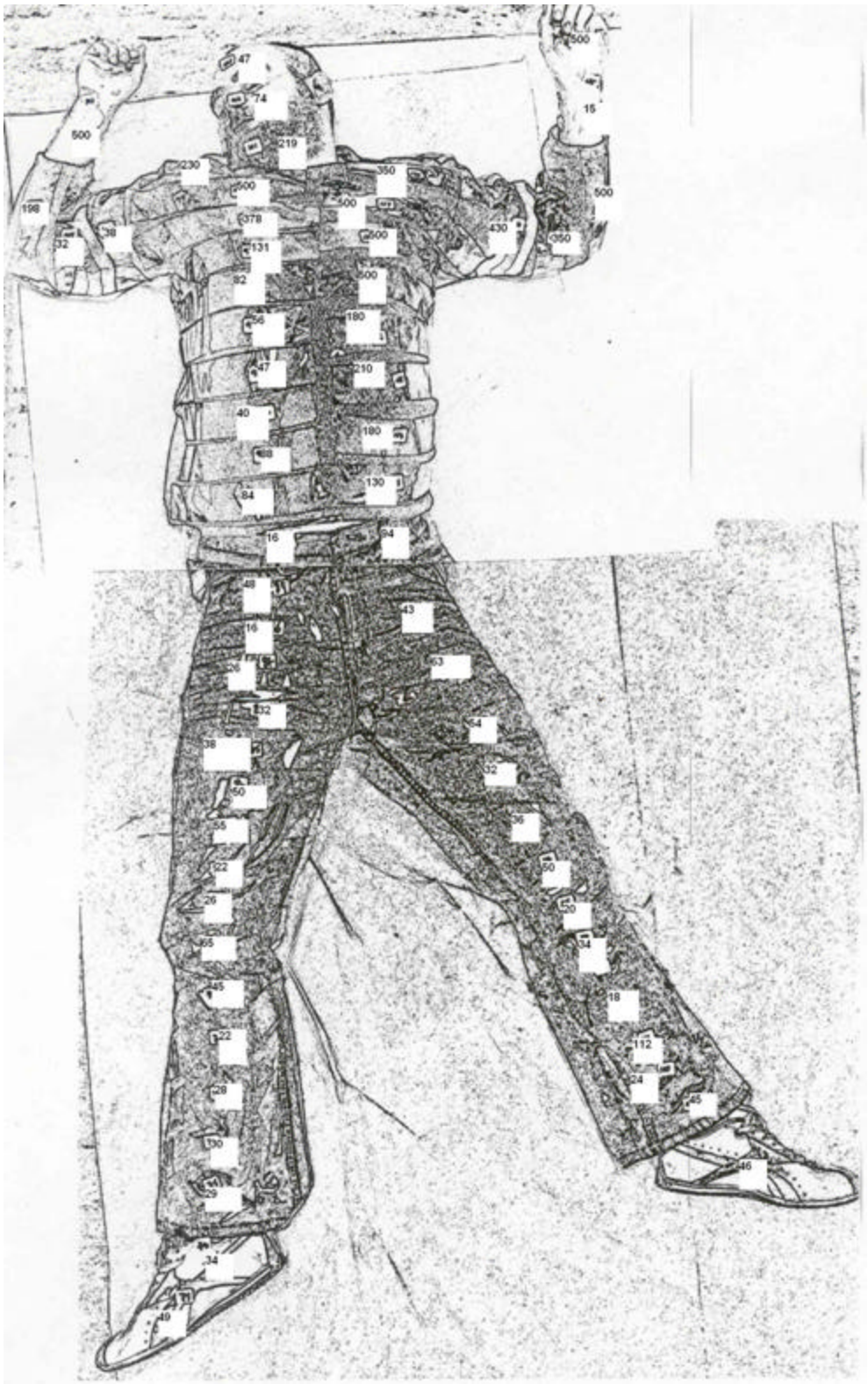
- It is a minor adaptation of existing fibre recovery process at scenes
- Much less resource and time intensive (at the scene and laboratory), resulting in *lower costs and quicker turn around times.*
- Lends itself better to standard fibre transfer analysis, if mapping is not required.
- *The resultant fibre maps are fit for purpose*

Whilst we would not completely rule out the use of '1:1 taping' for very specific scenarios, our recommendation would be that *the 'zonal taping' approach be adopted as standard practice in preference to the '1:1 method*'.

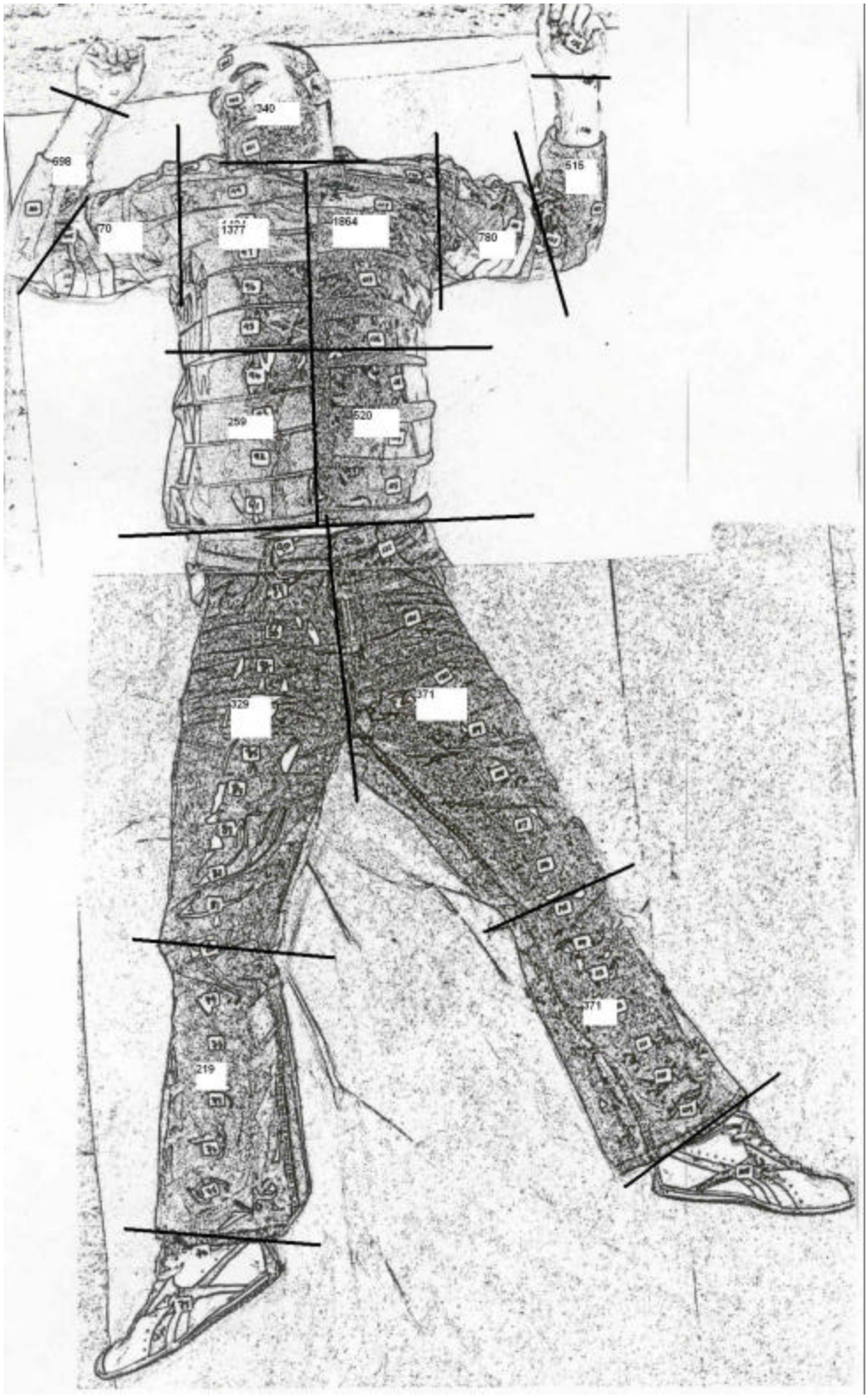
7. References

1. D. Nuebert-Kirfel, 'Das Leispurenkonzept – Der Dialog mit den stummen Zeugen der Tat', Krimialistik 2000 (6):398-404
2. K. Nehse, 'Using 1:1 taping to reconstruct a source', Trace Evidence Analysis 2004, Chapter 7, 191-210
3. T. Coyle, 'Fibre mapping – a case study', Science & Justice (44) 3 (2004), 179-186
4. T. Bierman, 'The advantages of using 1:1 taping', Proceedings of the 6th European Fibres Group Meeting, Dundee, 1998;44-47
5. M. Stauber,'Chances and limitations operating with potentially crime relevant textile fibre traces' Problems of forensic Sciences; 2001; V46; P239-248.

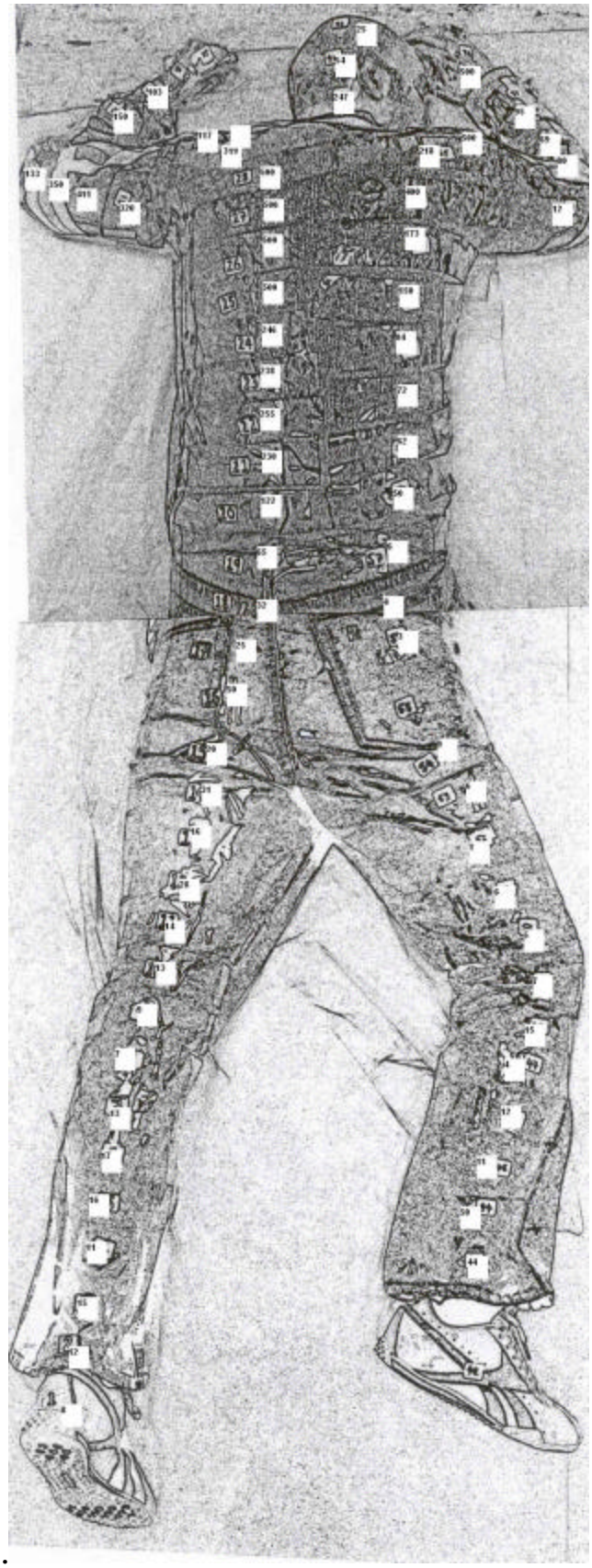
Appendix 1.



Appendix 2..



Appendix 3



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Appendix 4.