IDENTIFICATION CONCEPT AND THE USE OF PROBABILITIES IN FORENSIC ODONTOLOGY - AN APPROACH BY PHILOSOPHICAL DISCUSSION

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ABSTRACT

This paper questions the practitioners' deterministic approach(es) in forensic identification and notes the limits of their conclusions in order to encourage a discussion to question current practices. With this end in view, a hypothetical discussion between an expert in dentistry and an enthusiastic member of a jury, eager to understand the scientific principles of evidence interpretation, is presented. This discussion will lead us to regard any argument aiming at identification as probabilistic. **(J. Forensic Odontostomatol 2000; 18:15-8)**

Keywords: Identification, probabilities, expert witness.

INTRODUCTION

Courts are showing more and more circumspection when dealing with scientific evidence interpretation. This debate (on the way of presenting evidence) became apparent during experts' testimonies on DNA genetic evidence and could well extend to all forensic science disciplines. Despite half a century of practice vouching for its qualities, dentistry will not escape questioning as far as the scientific interpretation of evidence is concerned.

To a sensible observer considering evidence investigation practices in dentistry (for instance, the link existing between a bitemark and the dentition of a suspect), the conflicts of opinion(s) observed among practitioners worldwide can easily give rise to doubts on the foundations of the science, notably:

- Many experts consider a minimum number of characteristics; a formal identification is established only if the minimal number of corresponding characteristics between the observed mark and the image of the set of teeth or dentures from the potential source of the mark is put in evidence and no unexplained non-conformity is observed.

- Other experts exclude the idea of a minimum numerical standard. For them identification is a matter of judgement. The expert evaluates the contributions to individuality on a quantitative (number of characteristics) and a qualitative (peculiar characteristics, mark clarity, etc.) level.

Most experts refuse to give advisable opinion(s) (including experts in dactyloscopy, a science which inspired evidence interpretation in dentistry) pronouncing themselves either for an identification or an exclusion (except occasionally when no decision can be reached). They thus favour a deterministic approach to the detriment of a probabilistic one. This means in practice that a mark presenting five characteristics for example in common with a potential source may, in the end, have no conclusive value depending on the approach chosen.

This article questions the practitioners' deterministic approach(es) and notes the limits of their conclusions in order to encourage a discussion to question current practices. With this end in view, a hypothetical discussion between an expert in dentistry and an enthusiastic member of a jury, eager to understand the scientific principles of

evidence interpretation, is presented. This discussion will lead us to regard any argument aiming at identification as probabilistic.

During this debate, our two protagonists will be joined by a judge to remind us of the expert's esteemed help to Justice which allows the judge, as a last resort, to act as a decision maker based on a body of proof.

DEBATE

Juror:
In order to clear up my mind and better interpret the conclusions of your report, I would like to start with a preliminary question about numerical standards. Are the decisions which have been taken towards a minimum numerical standard based on scientific results or do they rather fulfil mandatory practices?

Expert:
I must say, that as far as identification is concerned no theory can justify[1] a fixed numerical standard. The identification process required goes beyond a mere counting of characteristics.

Juror:
Therefore I do not understand all the reticence towards qualified advice in dentistry.

Expert:
It seems impossible that the notion of probability can be applied to evidence. Experts have argued that every tiniest part of the tooth surface is strictly individual. The hypothesis that a bitemark could have several perpetrators thus appears inconceivable.

Juror:
I think I understand your argument. The information given by each part of the dental surface is complete and individual. However, can you say as much for fragmentary or poorly formed marks?

In case of a transferred mark, how do you explain the differences of interpretation methods between the mark and other biological evidence (blood, semen, etc.)? Is not any biological fluid also strictly specific to an individual when the DNA molecule is exhaustively studied? Qualified advice, i.e. the capacity to give an opinion combined with a probability seems to be an easy task for experts in genetics. So where does all this reticence come from?

Does not the acceptance of qualified advice mean a questioning of the very concept(s) of identification?

Expert:
Careful! Even if we accept your argument, the absence of figures could well make experts reticent when it comes to probabilities. The provision of qualified advice implies that the expert is also able to estimate the probability of the trace in question (or the number of persons which could be taken into account as being potential suspects). However, statistical data on variability are not numerous, not to say non-existent, when compared to the individuality which results from the combination of multiple factors, for example, such as the general dental shape and outline of the characteristics.

Juror:
If I understand you correctly, the aim is thus to collect statistical data and determine a model to estimate the probability of the shape of a dental characteristic. This seems logical and conforms with Locard's[2] doctrine on fingerprints applied to the rules of the identification process. He wrote notably: "there are few characteristics: in that case (the) print(s) show(s) no certainty but a presumption proportional to the number of points and their sharpness." Locard[2] considered that there was more to the evaluation of an identification than a mere counting of characteristics.

Expert:
Exactly. It is erroneous to regard scientific evidence as dichotomous asserting only an identification or an exclusion. Given the increasing set of values between exclusion and identification such a sharp interpretation appears rather inconceivable.

Juror:
Would it therefore be reasonable to think that dental characteristics could evolve by a mere phenomenon of transfer towards "more general", characteristics? For instance, a perfectly sharp break observed directly on a tooth can be regarded as unique. However, if the same break is transferred by pressure on a surface it can, when being taken, look blurred and merge into other dental patterns.

Expert:
Yes, the idea of transfer implies necessarily a loss of information and from that moment on, the idea of

"more general" characteristics is thoroughly justified. The concept covers a continuum of values which goes from (a) "poorly/weakly descriptive" to (b) "highly descriptive" characteristic(s).

Juror:

... however judges expect scientific evidence to be one-to-one and without any compromise!

Judge :

Actually, although judges prefer indisputable evidence, they would no doubt use wisely any evidence which, without verging on certainty, would become integrated into a body of proof. It is worth remembering that the expert only brings an element of proof to Court which becomes integrated into a body of proof useful for the identification decision.

Expert :

Then, the query about "identification" must be regarded as one for the judge(s) or Court and not for the expert. In his statement/conclusion(s) the expert will just comment on the strength of the link between a mark and a tooth where the probability of casual coincidence reaches almost zero when it comes to identification.

Judge:

At Court, the identification of an individual remains a judiciary matter which calls for a group of complicated and ill-matched/dissimilar data, as, for instance, material elements, testimonies or other circumstantial evidence. Although it is not always clearly admitted, the burden of decision rests with the Court and not with the expert.

CONCLUSION

What appears clear is the need

1. to emphasise that an element of scientific proof provided by the expert is an element among others which aims at supporting (or not) the hypothesis of an identification, or more generally, at supporting (or not) the link between the mark discovered and a potential perpetrator

2. to regard considering the objective part of this type of proof the argument proposed by the expert as probabilistic, in the sense that from the characteristics observed on the mark he will exclude a certain population (to have caused it) and this argument will have to be integrated in the Court process of decision;[3]

3. to require that from now on efforts be made in the collection of data and the application of a model to describe the decision process. Both Kirk,[4] * one of the pioneers of modern criminalistics, and a famous legal expert,[5] # have already considered such a questioning/answering practice: let's just reflect and follow their advice.

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* Much of this problem [most 'expert testimony' is purely opinion testimony] would be avoided if systematic study were devoted to the development of sound probability considerations applied to evidence interpretation and also to the areas in which statistical analysis could properly contribute to correct evaluations. This is a field for combined effort by the mathematician and the criminalist. It should prove to be a most fruitful area for research- one that would strengthen the theoretical foundation on which the more practical technical structure could rest with confidence.

If it can be stated that bitemarks are due to a human bite and they show shapes which an experienced dentist can identify as having been caused by an unusual mouth pattern and there is a suspect who has that pattern then there is a probability that the bites have been caused by the suspect. The degree of probability will depend on the features of the mouth pattern and on how many of these have been transferred to the body. It is here that the evidence of the dentist becomes vital and it is also the position where the forensic medicine expert cannot give a valuable opinion. There does, however, appear to be some conflict of dental opinion on this matter. Perhaps somebody will eventually work out the mathematics of the probability involved. I believe it is necessary to render our methods more efficient by taking greater cognizance of the logical steps in our schemes of identification and not to become lost in the beauty of our instrumentation .

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