(EARS AND) EARPRINTS, INDIVIDUALISING CRIME SCENE MARKS?!

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ABSTRACT: The lecture about this subject provides a short historical overview of ears and earprints in relation to the forensic field. The present state of the art will be mentioned as well as research that has been done or is about to start in this field. The relation between these marks and other better known and accepted marks like fingerprints and DNA will be discussed. Characteristic features will be highlighted to indicate the individualising properties of ears and earprints.

KEY WORDS: Ear prints; Forensic identification; Crime scene.

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INTRODUCTION

In the past few weeks, media in the Netherlands paid some attention to DNA, saying that DNA can tell the colour of your hair and eyes and other features that could become very important for the fight against crime. I would like to quote Armédé Joux, who in 1854 wrote: "Show me your ear and I'll tell you who you are, where you come from and where your going".

Joux published these words in "Gazette des hőpitaux de Paris 1854". Of course the author was not able to produce a portrait of a person, nor his present address or where he was heading to, just like the knowledge of the colour of eyes or hair of a person does not yet provide a portrait of the individual. Joux referred to his conviction that there is no other organ of the human body that can prove the relation between a father and his child in a better way. It is his believe that the shape of the ear is able to prove the authenticity of the descent, or the unfaithfulness of the mother very clearly.

If we look further in the history of ears and ear prints we will find Darwin, who attracted the attention of the scientific world regarding the ear, during his research about the relation with primates, by saying that the ear is one of the elementary organs. To prove for his position he pointed at the broadening of the middle of the helix (auricular tubercle), indicating that this is nothing else but a corner of the primitive ear which is reducing. Science re-

cognised this reducing of the corner and has tributed this part by naming it "tubercle of Darwin". Professor Doctor G. Schwalbe was one of the first to invent a method to measure the external ear. He was able to prove the theory of Darwin. He also was the first to attract scientific attention to the racial peculiarities in the structure of the ear.

Research in these areas has been carried out in various countries ever since. Especially after the World War I a lot of research was done in Germany. Most of those researches provide useful information about hereditary factors as well as figures about the presence of certain features within a certain group between races etc. In previous lectures I've pointed at the work done by Imhofer, Bertillon, Boulland, Rudinger, Oepen, Trube-Becker, Hunger, Hammer, Neubert and many others.

The first time an ear played a role in the identification process must have been around 1910. It was brought to the attention of the Medico Legal Society at London in 1910 by Evans. In his presentation regarding the identification possibilities, he referred to a trial at the Liverpool Assizes some time ago. There was difficulty in proving the identity of a prisoner from a photograph. The learned judge, Mr Justice Lord Collins was observed to be scrutinising a portrait very closely and to be comparing it with the defendant. His lordship then pointed out to the jury a peculiarity in the prisoner's ear, which was also observable in the photograph. The evidence for the prosecution was so much strengthened by this similarity that a conviction followed.

In the early fifties Alfred Victor Iannarelli started his research on photographs of ear, designing a classification method for ears to be used as an identifying tool for – for instance – military personnel that could not be identified by fingerprints of recognition. A similar research was done by a group of doctors in America to prove that the ear of an infant was suitable to be used for identification purposes to prevent cases of a baby mix-up.

During the sixties, seventies and eighties several studies were conducted regarding earprints, among these: research concerning pressure variation and differences regarding certain features; and research on differences between groups of people.

Fritz Hirschi from Bern in Switzerland was the first one in Europe as far as I can tell, who used an ear print to identify the perpetrator of a burglary in 1965. Earprints have been used in Switzerland ever since up till today. In many cases ear print evidence lead to a confession by the suspect which itself was enough to get a conviction. In other cases earprint evidence was brought to court and was accepted in most cases, contributing to a conviction.

Earprint evidence was first used in Holland in 1986. In that case, the district court accepted the evidence and the suspect in a hostage case was convicted. In the appeal case, the ear prints evidence was only mentioned as supportive evidence.

I have been involved in ear prints since 1987. I have brought many cases to court. Not all cases have been accepted or, if accepted, lead to a conviction.

Listening at a door or window is not prohibited in the Netherlands. Although I might be able to prove that the ear of a certain suspect matches an unknown ear print, found at the scene of the crime, one needs to have more supporting evidence. Only if a suspect denies ever having been on that particular place a judge in Holland might decide (believing that the ear print found does match the suspects ear) that he is lying and therefore convict him of the crime. Our Supreme Court has said about these cases that "evidence, showing that the suspect is obviously lying" can be a ground for conviction.

EAR PRINTS AND FINGERPRINTS

During trials or in interviews by the defence before a trial I am often told that ear print evidence is too NEW to be accepted at this stage. They point at the period it took for fingerprints to be accepted in a lot of countries. Lawyers tell me that no scientific research has been carried out so far to prove that there are no two ears on this planet alike or identical. The next step following that research, they say, should be a comparison between the ears and prints of ears, followed by research on the differences between earprints themselves. Because of variation in pressure there might be a possibility, they say, that two different ears leave the same print under a certain pressure.

Is this true and do we need to prove that no two ears are alike or identical?

That is why I want to take a look at fingerprints. Does anybody know of a research, scientifically based, that proves that there are no two fingers in this world that are identical?

What is needed for a research like this?

I think a lawyer would like us to take the fingerprints or earprints from everybody in this world and compare them to scientifically prove that there are no two fingers or ears that are completely identical. It cannot be done. There are over 6 billion people living in this world, most of them will have ten fingers and two ears. Imagine the material and time it would take to collect all of this and then compare them to each other. I'm not sure we would ever reach the stage that we can say: "Today we have proved that no two fingerprints or earprints are alike".

But do we need to do this?

With fingerprints we see that millions of comparisons take place every day. There is a history of some eighty years with fingerprints, but can we say that no two fingerprints are alike? Fingerprint experts all over the world can state for sure that over these years no identical fingerprints have been found

unless from the same person. But has the database of for instance England ever been compared with the one in France or Germany; or the American database with the one from Australia?

Nevertheless we feel confident individualising people by their fingerprints.

I have to say that comparing earprints does not have such a long history nor do we have a millions of earprints. Nevertheless I can say that I have not seen identical earprints unless they came from the same source.

CHARACTERISTIC FEATURES OF EAR PRINTS TOWARDS INDIVIDUALISING PROPERTIES

When we talk about identification there is a difference between features that are suitable for individualisation. Again looking at fingerprints we have class characteristics like loops, arches, whirls etc. We used to use those class characteristics to put prints into classes but we use minutiae to individualise. With earprints you could say that shape of the ear (oval, round, rectangular and triangular) and perhaps overall size (length and width) are class characteristics. Some people say that the features of ears are class characteristics as well. They point at the different features like helix, ant-helix, tragus, anti-tragus, concha etc. which are present in all people. So, they say, you need scars, birthmarks and other peculiarities to be able to individualise ear prints.

You will understand that I do not agree with that. Do we need scars or other peculiarities to be able to identify fingerprints?

Of course they can be of great help for fingerprints as well as for earprints, but if they are not there, does that mean you will not be able to individualise?

I want to take this opportunity to point at some of these features and show you the different ways in which they occur.

Let is first have a look at a picture of an ear and observe the various features.

First we observe the overall shape of the ear and its dimensions. Of course the dimension is a class characteristic. A lot of people will have ear with the same length and width. Pressure however does change this feature. To create the best possible hearing a certain pressure against the surface is necessary. The surface, whether it is a door or window or whatever, will function as a membrane to pass the sounds from the other side. One has to close the concha area to get an optimal performance of our hearing ability. In our research group about which I will be talking later, we refer to this pressure as being “functional” pressure. This will be different for a lot of people

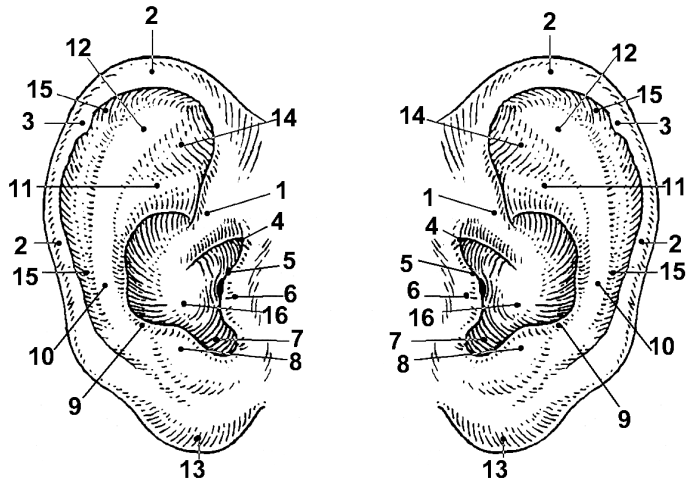

Fig. 1. 1 – Crus of helix; 2 – Helix; 3 – Auricular tubercle (knob of Darwin); 4 – Anterior notch; 5 – Anterior knob; 6 – Tragus; 7 – Intertragic notch; 8 – Anti-tragus; 9 – Posterior auricular furrow; 10 – Anthelix; 11 – Lower crus of anthelix; 12– Upper crus of anthelix; 13 – Lobule; 14 – Triangular fossa; 15 – Scaphoid fossa; 16 – Concha.

as it depend on the whole configuration of the ear. Pressure on various parts of the ear result in different dimensions.

I would now like to start with pointing at several features, starting with the crus of helix and then follow the outer rim clockwise.

The crus of helix has a variety of shapes and is one of the features that will almost always leave a print when an ear is pressed against a surface. On the screen you see the location of this feature and several examples of what a feature can look like.

The helix rim is responsible for the shape of the ear. The shape of the rim itself can be very diverse. In cross section it can be completely rolled as well as unrolled. The place where the unrolling starts or ends is different for everybody. An important role in the identification process is the inside edge of the helix rim. It may contain either notches or knobs and can have clearly visible angles.

At around two o'clock you may see the auricular tubercle or Knob of Darwin. This feature is not present in all ears. In one person it can occur in one ear only, so either left or right. Also multiple knobs are possible. They can be situated in the inside of the rim, on the outside, on both sides or only on the rim itself.

Starting again at the crus of helix and now going counter clock-wise we observe features like:

– Anterior notch;
– Anterior knob.

These features are not present in all ears. Sometimes they can be observed in the ear itself but not be visible in the ear print because of pressure.

– Tragus. The tragus is in fact a protection "lid" of the auditory canal. When the head is pressed to a surface very hard, it will close the opening.
– Intertragic notch. The intertragic notch lies in between the tragus and anti-tragus. Its shape depends on the shape and size of these features. It can be round, horse-shoe shaped of v-shaped.
– Anti-tragus. The anti-tragus can be dominant till hardly noticeable.
– Posterior auricular furrow. This feature is a groove or furrow between the anti-tragus and the anthelix and is not present in all ears.
– Ant-helix. Lower- and upper crus of ant helix. The ant-helix comes in many shapes and can, together with lower and upper crus be divided into different classes, according to the division by Dr. George Maat of Leiden University.

At the bottom we have the lobule or earlobe, with shapes as above (triangular, round, rectangular and lobbed.

From a anatomical point of view we can also observe:

– Concha;
– Triangular fossa;
– Scaphoid fossa.

These are features that will never print when the ear is pressed against the surface. The shape may well be observable.

You will understand that this is just a small example of the appearance of these features. The combination of these will individualise ear prints and thus give us the opportunity to individualise.

THE PRESENT STATE OF AFFAIRS WITH REGARDS TO THE USE IN CRIMINAL CASES AND UPCOMING RESEARCH

At this moment cases have been brought to court in several countries. Some cases were rejected, others accepted and have lead to a conviction. In two major cases in the United States of America and Great Britain an appeal is still going on. One of the major questions in several cases is: "Has ear print evidence been accepted in a fair cross section of the relevant scientific community?" From that question different other issues arise.

A working group, consisting of people working within:

– The Netherlands Forensic Institute;
– TNO-TPD, which is connected to the Technical University of Delft in the Netherlands;
– The Institute for Criminal Investigation and Crime Science;
– The Anthropological Department of the University of Leiden;
– The School of Mathematics and Computing of the University of Huddersfield;
– The National Training Centre for Scientific Support to Crime Investigation at Durham in the Unitd Kingdom;
– The Department of Forensic Medicine and Science from the University of Glasgow;
– The University "Tor Vergata" at Rome;

has worked together for over a year with funding from the European Committee. The object was a pre research to look at possibilities to overcome questions mentioned before.

We have looked at:

– Pressure distortion and a way to solve this problem for future research;
– The way in which ear prints can be secured and stored in the best possible way;
– Possibilities to "measure" ear prints and to store them in a computer database;
– The possibilities to use a computer programme for measuring ear prints;
– Statistical information necessary for future research;
– As well as possible research to be carried out with respect to: a) family relations; b) skin pattern analysis.

We were of course curious to find out whether we would be able to deliver statistical information on ear prints. We therefor chose to follow the same procedure as has been done for DNA. From this research we are convinced that we will be able to provide at least the same strength in evidence (statistically) as we are now able to produce for DNA.

We are now aiming for a four year research in this area.

I personally am convinced that we will be able to add another type of evidence, scientifically sound, and pointing directly to an individual, to the long chain of types of evidence. Not to replace whatever type of evidence or to exclude others, but to add up the possibilities to solve crime.

Nevertheless I am aware that being able to individualise from ear prints is not enough. People, especially scene of crime officers have to be aware of the fact that ear prints are there to be found. They will have to be educated in looking on the right places to find them. They have to be trained to recover and lift them in a proper way and store them into databases. We need to pay

attention to the collection of ear prints from criminals. It should become a common procedure to take ear prints, just like taking fingerprints of photographs.

Of course we need to train people to compare prints as well. Harmonisation and standardisation are key words in this matter.

I am prepared to do my utmost to help in any way to reach this stage, which has been my dream over the past 13 years. I cannot do this alone, although I have a lot of help already. Your attention and help can be very helpful to make my dream come true.