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Bite Mark Analysis: Cheaper Ways to Aid the Rural World.

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ABSTRACT

Bite marks are a vital and highly disputed form of forensic evidence. Bite marks can occur in cases of sexual or physical assault , robbery, or self-defense. The usual ways of collecting and comparing these bite marks to the assailant include 3D imaging, X ray techniques etc. However, in many places, especially in rural India, access to such specialised technology and the equipments required is highly limited and mostly unavailable. In such cases, the authors suggest the use of cheaper, more widely available resources to build dental record sample database against which the bite mark on the victim can be compared.

Keywords: bite marks, assault, cheaper technology

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INTRODUCTION

Bite mark analysis has been done to aid in criminal proceedings many times. Bites may be left on soft fleshy parts of the human body like stomach or buttocks. Forensic psychologists believe that bites are usually a sign of the mental status of the perpetrator who seeks to degrade the victim after assault and establish dominance. We seek to find simple reliable methods to find the same.

Limitations for the same include changes in bite mark on the victim over time, damage to soft tissue and more importantly similar dentition impressions of two individuals. In the US, the skin of pig is used collect dental impressions but that too has a disadvantage as the elastic properties of human skin and pig skin vary widely. In India, a lot of Hindus families are strict vegetarians and may refuse to give dental samples if it involves biting animal skin whereas the Muslims consider it to be an unholy animal. Thus this method can obviously not be applied to a wide range of the population.

Another popular technique includes the fingerprint overlay analysis where in the bite mark of the victim can be dusted with fingerprint powder, lifted and placed on acetate sheet. This method though cheap, is unreliable as the teeth impressions can be easily manipulated. Availability of materials may also be an issue. With technological advancement, 2D polyline method and painting method have become quite popular too. In both Adobe photoshop is used and they rely on accurate measurements of tooth width, rotational angles etc[for the former] and precise overlaying of images [for the latter]. Though 2D polyline method has turned out to be the more efficient model, the authors would again like to stress on the point that such techniques may not be applicable in rural India simply due to lack of adequate technology and skilled personnel.

However lack of technology to detect the same does not imply lack of need to detect it. The amount cases reporting abuse and violence which may include bite marks on the victim are on the rise in the country and hence its the need of the hour to provide a cheaper method to detect the same. Thus we suggest using cheaply available materials like four moulds to collect the dental evidence and use it to catch the perpetrator.
In the recent 2012 Nirbhaya rape attack, the bite marks were traced to two of the suspected rapists including Ram Singh who was imprisoned in Tihar where he later committed suicide.

In April 2015, former assistant police inspector Sunil Khatpe was linked as the molestor of a 29 year old model in police custody on whom the bite marks were matched with him and was found to be a match. Thus we can see that bite marks analysis is catching up however its mostly being done in high profile cases which has gathered media attention.

Scope

Human bite marks can be used as psychological evidence too as the type and intensity of mark can indicate the mental status of the biter. Bites are inflicted majorly for the following reasons-anger [usually impulsive because of frustration and inability to deal with the situation at hand], sadistic pleasure [to show dominance over the victim] and ego satisfaction[to satisfy their ego by degrading the victim].

Till the time technology to link bite marks to attackers does not become more widely available at cheaper costs, we can use the above materials for aiding in forensic odontology. This can help in forwarding the cause of forensic odontology and spread awareness among the most illiterate too that if they continue to subjugate the minor and the helpless to their mental incompetence and attack them, there are ways to catch them and ensure they end up behind the bars. Our affordable and clean technology is just the first step forward in the marathon that we have to run for the cause of justice.

MATERIALS AND METHODS

We used fruits, prepared plastic square plates and kneaded flour to collect dental impressions. We took 25 participants [aged 19-22] and a serial number was allotted to each volunteer. They had to take a bite of:

- Perishable substance like an apple

- Nonperishable substance like polystyrene sheets
- Proposed material to take dental impressions-freshly kneeded flour dough

For comparison, life size photography and double blind source was used. We prepared polystyrene plates of approx 16x12 cm dimensions and handed them around to each of the participants. Each of them wrote their names, age and sex on the sample collection plate. They folded the plate in two and inserted it in their mouth after which they bit it as hard as possible. The samples were then collected and stored separately for analysis later. Similarly we provided them with kneaded flour dough samples . They inserted it in their mouths and proceeded to bite it . The dough was given in two forms-a planar disc shape and a long horseshoe shaped cast. The samples were then collected and stored for later evaluation. Then we did a double blind test and took an anonymous test sample to compare against the collected samples and checked for accuracy of match by the different test participants. A normal digital camera was used to take the photos and care was taken that all photos were taken vertically to avoid any angular distortion which were later transferred to computer for printing and analysis. For impressions taken in kneaded flour dough [a negative impression] we added plaster of paris to create a positive impression , another widely available material , and contrasted it with another positive impression made with dental stone which was later traced out on paper with a pen.

We studied the following criterias to identify the anonymous dental sample:

- Arch size
- Position of teeth
- Number of teeth
- Impression
- Wear and tear

RESULTS AND DISCUSSION

There are different types of impressions that can be left by the biter. These impressions can be categorised as clear [application of significant pressure-fig 1] , obvious [application of medium pressure-fig 2] and noticeable [application of violent pressure-fig 3].

Fig1.

Fig2

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Fig 3

It was easier for the participants to analyse for surface bites using the polystyrene plates however samples with similar dentition properties had them a little confused. The master impression on the flour plates were good too [Fig 4]. Some participants reported feeling a minor gagging sensation while biting on the horseshoe shaped kneaded flour but most agreed that it yielded better dental impressions than the other two methods.

Fig 4

Using polystyrene plates we could identify the difference in the samples based on arch shape [round – fig 5, or ovoid –fig 6], number of teeth.

Fig 5

Fig 6

Though it is suggested to make it step one and go for saliva testing as DNA evidence to confirm the identity of the attacker before using the evidence as the only criteria to put him behind the bars.

CONCERNS

While taking negative impressions in kneaded flour dough, care must be taken that its preserved in cold temperature or it may turn bad and emit foul smell. While taking positive impressions using plaster of paris or dental stone, the set up must not be disturbed or the cast formed will not be accurate. Dental samples must be used as an aid to forensic investigation and not as the fulcrum of the defense.

It should be ensured that the suspects insert the polystyrene plate fully inside their mouths so as to ensure all their teeth are recorded in the mould sample otherwise the molars will be left out.

CONCLUSION

Thus we can use the above mentioned cheaper and widely available materials to collect dental evidence in rural areas and go for bite mark testing as an aid to the other techniques used for catching the suspect. Advancements in forensic odontology is the need of the hour and the authors are only proposing a cheaper way to aid in investigations till the more refined methods become readily accessible to one and all. But till the time that is not the case, its better to use the above techniques rather than using nothing at all and letting the perpetrators enjoy a free ride.

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