

Sexual Violence's Forensic Components

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ABSTRACT

Sexual assault victims may reveal their experiences to a variety of organisations, with the police and medical personnel being the most probable recipients. There are some evidence kinds that can be gathered without the necessity for a forensic medical practitioner prior to a clinical forensic examination. Only medical professionals who have undergone relevant, current, expert theoretical and practical training should conduct a forensic medical examination of a complainant or a suspect if the circumstances surrounding the assault and the necessity for one arise. It is very clear that only a few other criminal offences necessitate the thorough investigation and gathering of forensic evidence that a sexual assault does. The use of forensic evidence in a case can help in the identification of the perpetrator, the exclusion of suspect(s), and the prosecution of the case. The forensic medical examination components covered in this chapter are those that currently vary the most amongst jurisdictions around the globe.

Considerations for early evidence collection, using specialised medical examination facilities for sample collection, contamination issues related to evidence collection, and some practical aspects of forensic sampling methods that have evolved given results identified by Forensic Scientists processing evidential samples in sexual assault cases are the main areas of focus of this chapter. There will also be a discussion of some of the issues the provider of forensic science has run into.

The initial report and preliminary evidence

It can be necessary for the first person with the necessary training to speak with the complainant to gather specific early evidence kinds. Among these samples could be sanitary products, urine for toxicity testing, samples from the area of the mouth where possible oral intercourse occurred, samples of the hands and fingernails, and non-intimate skin samples. The choice to take these samples is made depending on the patient's wellbeing, acute medical needs, the presence of a forensic medical practitioner (FMP), or delays in getting to an institution that conducts forensic examinations.

The Forensic Science Service and the Metropolitan Police created one of the first specialised early evidence kits in 2001. 'Her Majesty's Inspector of Constabulary' and 'Crown Prosecution Service' report on the joint inspection into the investigation and prosecution of cases

involving claims of rape, issued in April 2002, recognised the kit's practicality as good practise. 1 Evidence suggests that front-line officers and Accident and Emergency Departments in many countries now have easier access to the idea of early evidence kits. 2 Jurisdictions may want to think about the viability of keeping a few kits in police patrol cars as a backup to having kits readily available at test venues or with examiner programmers. However, even within a single jurisdiction, temperature variations must be taken into consideration because heat exposure can alter the contents of a kit before usage. It is crucial that an FMP determines whether any of these samples have already been obtained and by whom before a meeting with the woman.

Practically speaking, clothing worn by the complainant at the time of an alleged assault is typically seized with their consent because it may offer valuable forensic evidence for contact traces and may also offer crucial points of reference for the FMP in relation to injuries (for example, where the clothing is damaged). It is standard procedure to seize this apparel before the FMP assesses the complaint. It is best practise for the FMP to determine whether the complainant has arrived in their original attire and whether any damage or injury has happened at the time of call-out. 3 In such circumstances, it is advisable to request that the woman continue to wear the apparel until the FMP has evaluated her. It is agreed that cutting the garment to make it easier to remove could be necessary if a significant injury has occurred. Cutting through any pre-existing damage should be avoided since it makes it difficult for the FSP to evaluate the damage in light of the nature of the assault. If clothing needs to be taken off, it is best practise for the FMP to communicate with the emergency team. Record photography of the wearer's style and the placements of their apparel, as well as the degree of any damage before removal, is thought to be helpful. For instance, once the clothing is removed from the body, it is challenging to evaluate damage positions with hosiery. Whether the forensic scientist should view video or photographic evidence captured by the FMP in regard to clothing damage, injury, body mapping in connection to contact traces, and body fluid recovery is a matter of controversy.

Identification of forensic sample locations

In respect to sexual assault investigations, trace DNA analysis has become a crucial component of an FSP's workload. In recent years, DNA techniques based on polymerase chain reaction have made it possible to create profiles in sexual assault instances that were not previously studied. The success of numerous national offender DNA databases is a result of this. [12-19]

It's crucial to know which areas to focus on when working with trace samples from sexual assault complainants or suspects. Such tiny samples are not immediately evident by their very nature.

Swabbing a presumed trace sample region that is less than the actual deposition area may result in the undercollection of some of the pertinent material. Alternately, sampling a much broader area than the actual deposit may result in the sample being spread out across a bigger surface area and collecting or becoming diluted less sample overall. Both practical methods could provide a false impression of where the sample was actually taken. Since non-invasive detection techniques are advantageous in this situation, the Polilight is frequently utilised in the initial examination of patients in a number of countries.

Numerous investigations have demonstrated the importance of speculatively scanning clothing items and scene objects for their Polilight equivalents[20-25]. As the light penetrates the epidermis or upper layers of the skin down to a few hundred microns in depth, forensic odontologists utilise ultraviolet photography to capture bite marks on skin. This technique helps to focus on the surface damage while minimising the appearance of apparent bruising. Traditional photographic techniques may obstruct the ability to perceive the damage and its characteristics, according to studies on the subject. [16,17]

Forensic medical examination equipment

It is impossible to address the differences in sexual assault evidence collecting kits within the confines of this chapter because they vary between nations and even between jurisdictions within the same nation. It is crucial that the kit, or its modules, undergo regular reviews for effectiveness and usefulness based on data acquired from the FSPs, and that any necessary improvements are implemented. In the UK, the Faculty of Forensic and Legal Medicine has a scientific committee that meets twice a year to discuss the contents of forensic kits used to sample complainants and suspects of sexual assault. This committee is made up of FMPs, FSPs, police investigators, and forensic kit producers. After the discussions, a sample recommendation document is created for faculty members with any revisions marked within it. [4] For example, if a new evidence collection process is implemented, facilities need to know what additional supplies should be easily available to FMPs. It is crucial to establish mechanisms to guarantee that kits at exam facilities are kept up to date.

There are differences in who pays for forensic medical examinations as well. In some countries, the expense can fall on the individual, especially if the complainant chooses not to contact the criminal court system right away and instead provides anomalized samples. In other jurisdictions, whether or not the police are engaged, the local criminal justice organisation is responsible for covering the cost of the medical examination and the forensic analysis of the samples. Where anomalized reporting is relevant, it is not uncommon for a limited forensic funding to be made available. Decisions about evidence collection that are based on unrelated reasons, such as a criminal justice agency's unwillingness to pay for the collecting of sexual assault evidence or the accompanying forensic analysis, should be actively discouraged by training and policy.

A skin sample

Many people refer to little amounts of DNA that are conveyed through skin contact as "trace DNA." According to Wickenheiser, it is difficult or impossible to identify the cellular source of origin (such as buccal and epithelial) due to the tiny number of cells and the manner of transfer.

43 The only way for the forensic scientist to determine whether the fluid is perhaps saliva is if there is evidence of licking, kissing, or biting, as these actions may also transfer salivary amylase. The Phadebas amylase test is still the common test used by many FSPs. However, specificity is a challenge because amylase can be found in bodily fluids other than saliva.

The research by Sweet et al.¹⁴, who demonstrated that it is feasible to extract a DNA profile from saliva stains (matching to a bite mark) on the skin of a cadaver where deposition had happened up to 48 h previously, encouraged the use of a double-swabbing technique. In this method, the first swab is moistened, and the second swab is left dry. It could be claimed that if the first swab was successful in absorbing all the moisture it deposited onto the skin, then keeping the second swab dry may prevent it from collecting as much from the sample site as if it had been saturated before swabbing. Any remaining water must be retrieved at any costs. The FSPs try to co-extract the swabs when many swabs are utilised to maximise or improve DNA retrieval. [15-18]

The handling, processing, and storage of collected swabs varies between jurisdictions. For the integrity of prospective forensic evidence to be preserved, the sample must be properly collected, stored, and analysed. In sexual assault cases, stabilisation is an important step in the chain of evidence because the FSP frequently considers biological evidence and DNA tests resulting from it. Typically, samples are not tested for forensic purposes right away after collection. Retesting of previously stored DNA samples is also not unusual when new technologies are developed or when there are additional requests made as part of an investigation.

According to limited research, when biological material is allowed to dry on a swab before extraction, less DNA is obtained than when the swab is treated right away while it is still moist. Practically speaking, this is due to the fact that the FSP laboratory and the forensic medical examination facility are not in the same place. As a result, in some jurisdictions, the gathered swabs are kept frozen throughout transportation to the FSP and preserved frozen immediately after collection. These storage options are pricey due to the high cost of electricity in some nations, the amount of space required, and the potential for failure. According to research, freezing swabs instead of drying them before extraction yields DNA recovery rates that are comparable to those of a tested damp swab.[21-22] Other various instances demonstrate how degradation can happen while being stored, whether it's in the cold or at room temperature.

There are several different ways to sample fingernails where there may be trace evidence be there. Among them are trimming nails and using fine-tipped swabs to scrape or clean behind the surface. Logically, the hyponychium of a fingernail is a remote location where biological material may assemble and can be an important source of evidence in police investigations. While the Trace amounts of skin, body fluids, hair, fibres, and plants may accumulate during a sexual assault. either the complainant's or the attacker's nails. Nowadays, it's not unusual for complainants' nails are neatly done. Acrylic and gel nails, which are artificial nails, have worldwide acceptance among women since the late 20th century. Therefore, the FMP must exercise caution that it is exceedingly difficult to cut fake nails, and that either cutting genuine or fake nails could make a complainant unhappy increased stress The research does not make it apparent what type of sample is best to obtain.

Much study has been done on the DNA splicing of debris from fingernail samples and the importance of the findings. 33% of fingernail samples from casework analysis were reported by Wiegand et al.¹⁵. contained DNA from a foreign source, and the persistence of foreign DNA

tended to disappear after 6 hours. Cook and Dixon, 56, on the other hand, carried out a study using 100 volunteers' fingernail swabs.

About 13% of samples included foreign DNA, but only 6% of them gave detectable mixed DNA profiles, indicating there was little foreign DNA under people's fingernails.

Therefore, caution must be used while evaluating the value of fingernail sample. According to research done by the Forensic Science Service in 2003, the complainant's vagina was digitally penetrated by the attacker in one in five (18%) of the sexual assault cases that were submitted for analysis (Turton S, Assistant Intelligence Officer, Forensic Science Service March 2003, personal communication). 58 The hands of detainees are not sampled as a priority, and little thought is given to protecting loss of potential evidence by the application of gloves or hand protectors before hands and nails are sampled (Newton M, UK Independent Forensic Advisor for Rape and Serious Sexual Assault, October 2011, personal communication). This is according to a survey of police officers working in custody units throughout the UK. [19]

Due to the small amount of material that is anticipated to be retrieved, fingernail samples submitted to the FSP are extracted as sets of right and left samples. Therefore, it's crucial that only two samples—one from each hand—of fingernails are taken. The case where a nail is fractured or damaged is the exception. These need to be packaged separately and marked with the hand and finger from where the sample was taken. It is also advised to take pictures of the obvious damage prior to taking the sample.

There are several alternative methods for sampling fingernails that may contain trace evidence. These include trimming nails and using fine-tipped swabs to scrape or scrub the surface. The hyponychium of the fingernail is a logically isolated area where biological material may collect and can be a crucial source of evidence in police investigations. Trace amounts of skin, bodily fluids, hair, fibre, and plants may accumulate under the nails of either the complainant or the attacker after a sexual assault. Nowadays, it is normal for complainants to have perfectly manicured nails. Since the late 20th century, artificial nails like acrylic and gel nails have gained popularity among women all over the world. Therefore, the FMP needs to be aware that cutting genuine or false nails can contribute to a complainant's stress and that cutting false nails is exceedingly difficult. The research does not make it apparent what type of sample is best to obtain.

The importance of the results from DNA typing fingernail debris has been the subject of extensive research. According to Wiegand et al.¹⁵, 33% of fingernail samples from casework examination had DNA from an unknown source, and the persistence of this DNA tended to fade within 6 hours. Cook and Dixon [16], on the other hand, looked at fingernail swabs from 100 volunteers and found that 13% of samples included foreign DNA; however, only 6% of these samples had reportable mixed DNA profiles, showing that the prevalence of foreign DNA under fingernails was low.

The FSP will most likely sample hair from a sexual assault complainant or suspect to look for body fluids, foreign hairs, fibres, or other particles. Some governments simply collect pubic combings, whereas others collect both pubic and head combings. If the woman's genital region

was the target of the assault, pubic hair combings are frequently gathered. Because sexual assault victims find it demeaning to have their pubic hair sampled, the FMP needs to comprehend why taking the sample is necessary. Exline et al. study 11 's shows that there is little to no pubic hair transfer between individuals who have engaged in 'missionary' sex, even when samples are taken soon after. Stone and Mann [12,13] However, 15% of the sexual assault cases evaluated by FSPs across the USA revealed a pubic hair connection between the complainant and the suggested perpetrator. 14 Therefore, a sample of pubic hair taken during the physical examination may be pertinent. Even though the general public is more likely to shave their pubic hair in hygiene-related jurisdictions, if a patient has pubic hair, it is important to remember that it does not change over time as much as head hair does. As a result, a sample can be collected at a later time for useful comparison reasons. The sample should be taken at the time of the forensic medical if fibres or particles are significant. If fibre exchange is thought to be important, using low-tack sticky tape as indicated in Salter and Cook's study is a better alternative to combing hair samples. [15] If the hair has not been washed, they discovered fibres can stay in the hair for up to 7 days.

Identification of sperm

Semen persistence is a benchmark for determining whether intimate samples are frequently taken in sexual assault instances. For instance, regular collection takes place in Hong Kong if the woman shows up within 24 hours of the alleged offence, although samples may be considered outside of these time frames based on the specifics of the case (Bah P, Hong Kong, April 2012, personal communication). 19 According to Barbu C., Head of Forensic Science of Covasna County, Romania, April 2012, personal communication, vaginal swabs are typically taken within 48 hours and sporadically even up to 72 hours. 80 The conventional time limit for gathering evidence in several American jurisdictions is 72 hours, but once again, the medical forensic history determines whether samples are taken after this point. 81 DNA can now be recovered from progressively smaller amounts of cellular material thanks to modern forensic procedures. In sexual assault instances, traces are frequently all that are ever found. Additionally, only half of the DNA complement of diploid cells is present in the DNA generated from haploid cells (semen) (3 pg compared with 6 pg). In fact, the likelihood that the alleles making up the donor profile are fully represented decreases as the number of cells sampled decreases. Short tandem repeat DNA profiles can be created from few cells using the low copy number profiling technique. It has been claimed that a DNA profile can be created with just 10 haploid cells. Additionally, forensic investigators may be able to identify fewer individual cells for polymerase chain reaction using a technique like laser micro-dissection (Gill P, Professor of Forensic Genetics, Oslo University, April 2012, personal communication).12

Cloudy assembled swabs are prepared by adding a wetting agent, typically saline, to a slide that the collected swab is then wrapped into. The slide is then air dried with a cover slip in place before examining the slide, therefore extreme caution must be used to avoid DNA contamination. 84 However, in some jurisdictions, the crime lab is in charge of all evidence analysis, therefore the swabs are submitted without any alteration or extraction beforehand.

The FSP can consistently detect the presence of sperm on permanently stained slides, but due to time delays, they are unable to detect motile sperm. The investigation and the patients' decision-

making may be impacted by information regarding the existence or lack of sperm and motile sperm discovered during the examination. There are two issues with examiners performing wet-mount sperm evaluations: (1) their results may differ from those of crime labs (the examiner may not discover sperm, whilst the FSP finds); and (2) the FMP may use up material that the FSP could use when performing DNA analysis on the sample. Practical studies on techniques used globally show that there are significant differences in the circumstances under when, how, and when sperm visualisation occurs.

CONCLUSION

When it comes to the forensic components of sexual violence, the FMP and the forensic scientists employed by the FSP face numerous difficulties. The identification and maintenance of best practises in forensic sampling depend on a good examination strategy recorded by the FMP, taking into account pre- and post-offence activity by the complainant and suspect, in addition to evidence-based sampling persistence data supplied by the local FSP.

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