

Forensic Evidence in Civil & Criminal Trials

By

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Outline

- Let's learn **Forensic evidence** in **Civil Trials**
- Let's learn **Forensic evidence** in **Criminal Trials**

Forensic Evidence

CIVIL CASES

- Disputed paternity
- Disputed maternity
- Succession
- Inheritance

CRIMINAL CASES

- Sexual offence
- Murder
- Mental disease
- Child as an Adult

Forensic Evidence

- Trace evidence
- Injuries
- Sexually transmitted infections
- DNA profiling
- Lie detector
- Brain mapping
- Narcoanalysis
- Cyber forensics
- Ballistics
- Fingerprints
- Document analysis
- Handwriting expertise
- Toxicological analysis
- Hair & Fibre evidence
- Bite mark analysis

Forensic Evidence

- Scientific evidence V Eye witness
- Silent witness
- Objective Credible Chain of custody
- Trustworthy V Corroborative
- Convictions & longer sentences
- How and when was it obtained?
- Was there an opportunity for it to be contaminated or otherwise compromised?
- Does a particular piece evidence, in fact, actually point to guilt or innocence?

Forensic Evidence

- Establishes elements of crime / act
suspected substances as contraband drugs
- Associates or Dissociates suspects / accused
from the crime / act

Associating – fingerprint, Firearm, blood, semen,
hair, fibre

Dissociating – Inconclusive forensic tests

- Helps reconstruct the crime / crime scene / act

Forensic Evidence

- Investigating Officer
 - Forensic Scientist
 - Doctor / Medical Officer
-
- Living / Dead person/s
 - Scene of crime / Incident

Forensic Evidence - DNA

Indian scenario

- Section 45 to 51 IEA
- Expert opinion relevant

Daubert checklist

- Whether it can be **tested**;
- Whether the theory or technique has been subjected to **peer review** and **publication**;
- Known or potential **error rate**;
- **General acceptance** of the technique in the relevant scientific community.

General Acceptance test
Relevance test

Limitations of Forensic evidence

Deccan Herald (Bangalore) 14/10/2014

Forensic science set up battles serious deficiencies

By T R Baggi

The dramatic twist, with the submission of 'final' post-mortem report to Delhi Police, in the mysterious case of Sunanda Pushkar's death has once again brought to the fore the serious deficiencies and lack of coordination between the departments of forensic medicine and toxicology, and forensic science laboratories. Being a sensational case with high socio-political connections, the case has attracted media attention and has been greatly publicised; otherwise, thousands of such cases pertaining to ordinary citizens go unnoticed in the routine.

Forensic science, which is an integral part of sciences, is facing a serious identity crisis in the country. The forensic science has never been given its right place in the science policy of the country. The scientific organisational or laboratory management principles have never been applied to FSL. They are either run like offices or police stations on shoestring budgets with skeleton staff that are paid peanuts. There is no awareness at all in the field of science and technology about forensic science. The al-

location of funds for their growth of both in the universities and FSL are abysmally small and negligible.

While modern forensic science has to work in the frontier areas of science using the cutting edge technologies if it has to deliver meaningful contribution to the criminal justice system, the forensic community in India is totally cut off from the mainstream of science and technology both academically and professionally. Forensic science is a multidisciplinary subject and it has to draw the knowledge, expertise and inspiration from all pure and applied sciences to effectively apply to crime prevention and crime investigation.

It cannot function effectively if it works in total isolation from the scientific culture and temper under the umbrella of police and other law enforcement agencies. Is it not a surprising paradox that while India has made giant strides in the field of agricultural, pharmaceutical, nuclear, medical, computer and space sciences, forensic science has remained totally static and technologically way behind by couple of decades when compared to other developed countries? Leave alone the advanced



innovative forensic research, the forensic laboratories are not even able to adapt routine analytical methodologies developed abroad decades ago for want of personnel, and infrastructure.

Due to serious limitations of staff, infrastructure and abnormally large number of cases, the forensic scientists are not able to show the optimal performance. It may not be out of place to point out that their performance has plummeted to a level much below the internationally accepted parameters. In the absence of where-withal, foren-

sic laboratories are forced to perform name sake formality or ritual of analysis. Modern scientific activity be it routine work or research are highly fund resource intensive. As per the law of unattainable triads, we cannot get accurate and fast results cheap.

If we expect accurate, meaningful and fast results from the forensic laboratories, there are no cheap options. We have to invest lot of funds for highly qualified, experienced and competent human resources, infrastructural facilities like buildings, instrumentation, library etc. The accountability in forensic science has been minimal in the past and it must be brought in the ambit of main stream science and technology. Rigorous accountability should be there through appraisals, assessments and expert reviews by multidisciplinary expert members from different institutions.

Toxicology issues

A committee was appointed for revamping the forensic science in India by the Union Ministry of Home Affairs in 2010 did its job within severe limitations and submitted its report in July 2011. However, it will hardly shake the frozen outlook and liberate

forensic science from its shackles. Even though the recommendations of this committee were said to have been accepted by the ministry in toto, they have not been implemented to date. Apart from forensic scientists, the committee should have had members from CSIR, ICMR, DRDO universities, judiciary and law enforcement agencies like the Department of Justice, USA (Strengthening Forensic Science in the United States: A Path Forward, National Academic Press, 2009) to have a meaningful outcome.

The plight of the Department of Forensic Medicine and Toxicology in the country is not different from FSL. The facilities of autopsy theatres as well as pathology/toxicology laboratories attached to them are either not existing or inadequate. Strangely, there is absolutely no interaction between the forensic pathologists (autopsy surgeons) and the forensic analytical toxicologists who examine the same case. The above Committee has recommended that all the toxicological analysis work has to be carried out in a sophisticated laboratory attached to the autopsy theatre under the supervision of the forensic pathologists, as is done in USA

under their Medical Examiners system.

The government and the scientific institutions in general and forensic science laboratories and Department of Forensic Medicine and Toxicology in particular should synchronously work to foster the growth of forensic science in the country through an integrated approach towards forensic science education, routine forensic work and research and development work. Whole forensic science set up needs to be overhauled and reorganised completely, at all levels, however difficult or painful it is.

This can be done by liberal funding to all agencies concerned and at all levels for improving the availability of human resources, boosting the infrastructure to an excellent status, promoting good science and good research, integrating forensic science with main stream science and technology and giving complete scientific autonomy free from red tape, bureaucracy and non-interference from the police or administrators. (The author is former Director, Central Forensic Science Laboratory and till recently, Academic Coordinator, Forensic Science, Department of Chemistry, University College of Science, Osmania University, Hyderabad)

Limitations of Forensic evidence

- Much of Forensic Evidence is to be compared?
- Accused is not caught immediately
- Evidence not sent timely to the (FSL) Labs
- Due to poor infrastructure (staff / funding / equipment) no speedy testing
- No chain of custody maintained
- Not all sensitive / specific or confirmatory tests
- No accreditation – NABL / JCI? Of **all** labs???
- No Defense labs..... Bias
- No interaction between FSL and the Doctors??

Limitations of Forensic evidence

- Evidence only analysed by FSL if sent via Police
- Voluntary reporting to hospital –evidence does not get examined by FSL if not sent by police

SEXUAL OFFENCES

Evidence in Sexual Violence

- Oral testimony of Survivor
but requires corroboration?!
- Linking the facts with Forensic Evidence

Forensic Evidence?

In the past

- If Forensic evidence was **negative**
Absence Of semen, spermatozoa, hair, injuries
very difficult to prove a charge of RAPE
- Such importance given - Forensic Evidence

Why Forensic Evidence?

Today.....

- If Forensic evidence is **negative**
Absence Of semen, spermatozoa, hair, injuries
still it could be a case of RAPE ?!!!!
- Because the definition of **RAPE / SEXUAL ASSAULT**
Changed
- Penetrative – Peno vaginal, Peno anal, Peno oral, Body parts- fingering, Objects
- Non penetrative – Kissing, Touching, Manipulating
- Hence- **Not Much Demonstrable** Forensic Evidence

What is Forensic Evidence in SO?

Trace evidence

- Locard's principle of exchange
- Semen , Spermatozoa, Blood, Hair, cells, Dust, Paint, Grass, Lubricant, Fecal matter, Body fluids, Saliva
- **Body fluids** – Drug / Alcohol - Blood, Urine, Breath, Sweat

Injuries – Body / Genitals..... – Skin / Mucosa

- Abrasions, Contusions, Lacerations, Fractures

Incised / Stab / Chop / Firearm injuries

STIs – HIV, Hepatitis, Gonorrhea

Pregnancy & Complications

– POC, Foetus – MTP, Delivery

Evidence of treatment

– pain, infection, depression...

Based on

Analysis of POCSO cases in Five States

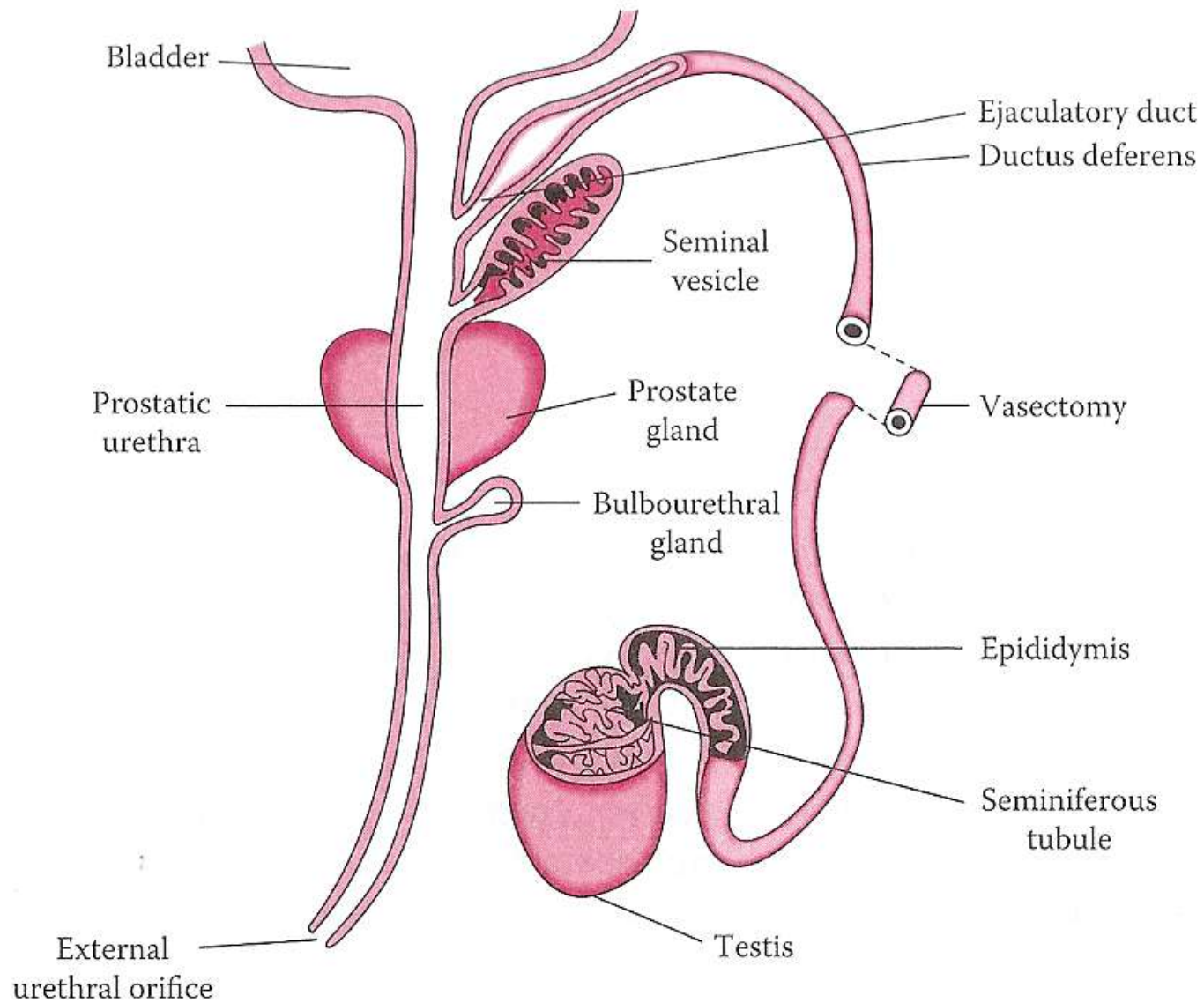
Assam, Andhra Pradesh, Delhi,
Maharashtra, Karnataka

On **appreciation** of Medical Evidence

National Law School of India University, Bangalore
*CCL-NLSIU, Implementation of the POCSO Act by
Special Courts: Challenges and Issues* (2018)

SEMEN

- Penetrative assault by penis
- Ejaculation into orifices / surface of body/ at the scene of incident
- Use of condom – its recovery or NOT?
- Vasectomy – its impact on evidence!
- Azoospermia / Necrospermia
- Penetration by Objects / Body parts
- Nonpenetrative assault / No ejaculation /
No condom recovered / ??? Vasectomised!



Biological characteristics of Semen

- Typical ejaculation
 - 2-5 ml of semen, 160 million sperm
 - 3 pg DNA/sperm = 480,000 ng DNA/ejaculate
 - Only 1 ng DNA needed for STR typing!
- Seminal fluid
 - Medium for ejaculation
 - Enzymes and other proteins
 - Choline, Spermine, Zinc, Acid Phosphatase (AP), Prostate Specific Antigen (PSA), and semenogelin
- Sperm cells or Spermatozoa

Presumptive vs Confirmatory Tests

- **Presumptive tests**
 - Fast, easy, inexpensive
 - Great for screening evidence to find possible stains
 - Usually detect enzymes specific to the body fluid
 - False positives (hence “presumptive”)
 - Open to attack in court
- **Confirmatory tests**
 - Not available for most body fluids
 - Main exceptions are semen and blood

Presumptive tests

- Florence test

Choline of seminal vesicles

- Barberio's test

Spermine of prostate

- Zinc test

Zinc from prostate

140mg/ml in contrast to 1.2mg/ml for
normal blood serum

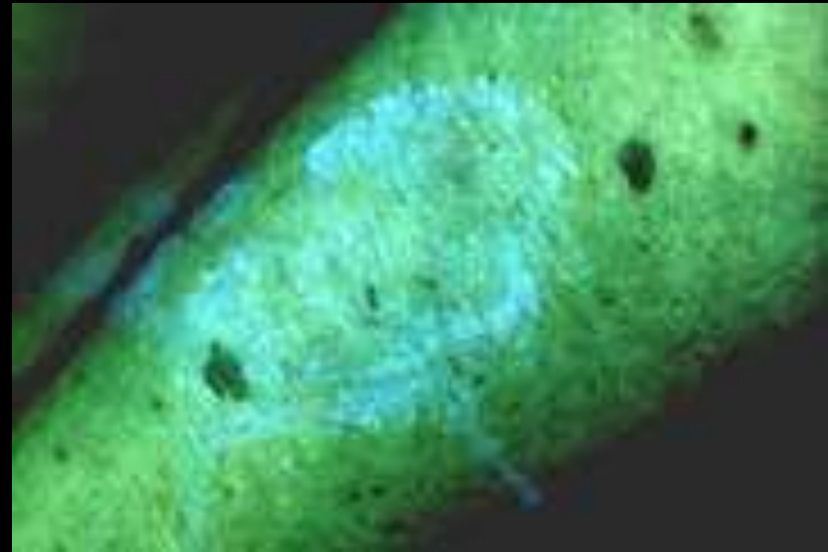
can be detected in older stains

- Semen Fluoresces under UV light

Wood's Lamp Examination

1. Does a wood's lamp effectively detect semen? American Family Physician, May 15, 2000
2. Sexual abuse of children, Detection of semen, Am J Dis Child. 1992 Jun;146(6):700-3
3. Wood's lamp utility in detection of semen. Pediatrics, 1999 Dec;104(6):1342-4

X - water-based lubricant, petroleum jelly, antibiotic ointment and lotion , saliva



Acid Phosphatase enzyme (Prostate)

– Advantages

- High levels in fresh semen stains
- Very fast, inexpensive

– Limitations

- Activity may be weak or absent in older stains
- Also present at low levels in vaginal fluid and bacteria, cauliflower, Almonds, snake venom
- Not species-specific

Prostate specific antigen

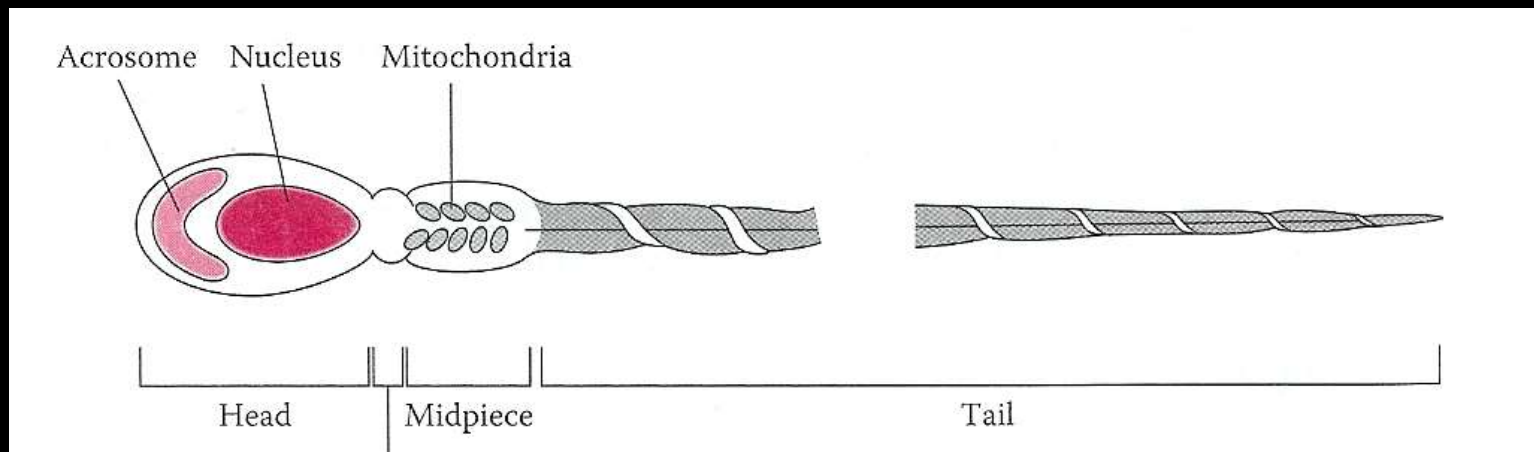
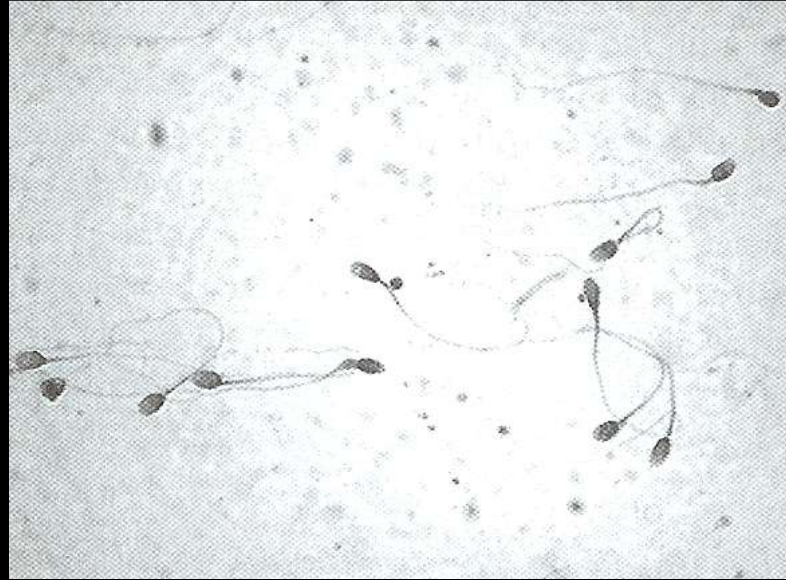
- Major protein in seminal fluid
- Also detected in urine*, fecal matter, sweat, milk but at much lower levels
- Half-life of dried stain: 3 years
- Hydrolyzes semenogelins (seminal vesicle specific antigens)
- Detected with immunochromatographic test strip assay
- Schmidt S et al, Prostate-specific antigen in female urine: A prospective study involving 217 women; *UROLOGY* **57 (4)**, 2001, 717-720

Semenogelin or Seminal vesicle specific antigen (SVSA)

- Higher concentration in seminal fluid than PSA
- Not found in urine, milk, sweat
- Greater specificity for semen than PSA
- Detected with immunochromatographic test strip assay – rapid and simple

McGee RS, Herr JC, Human Seminal Vesicle specific antigen during semen liquefaction, *Biology of Reproduction*, 1987,37, 431-439

Confirmatory test for Semen



Confirmatory test for Semen

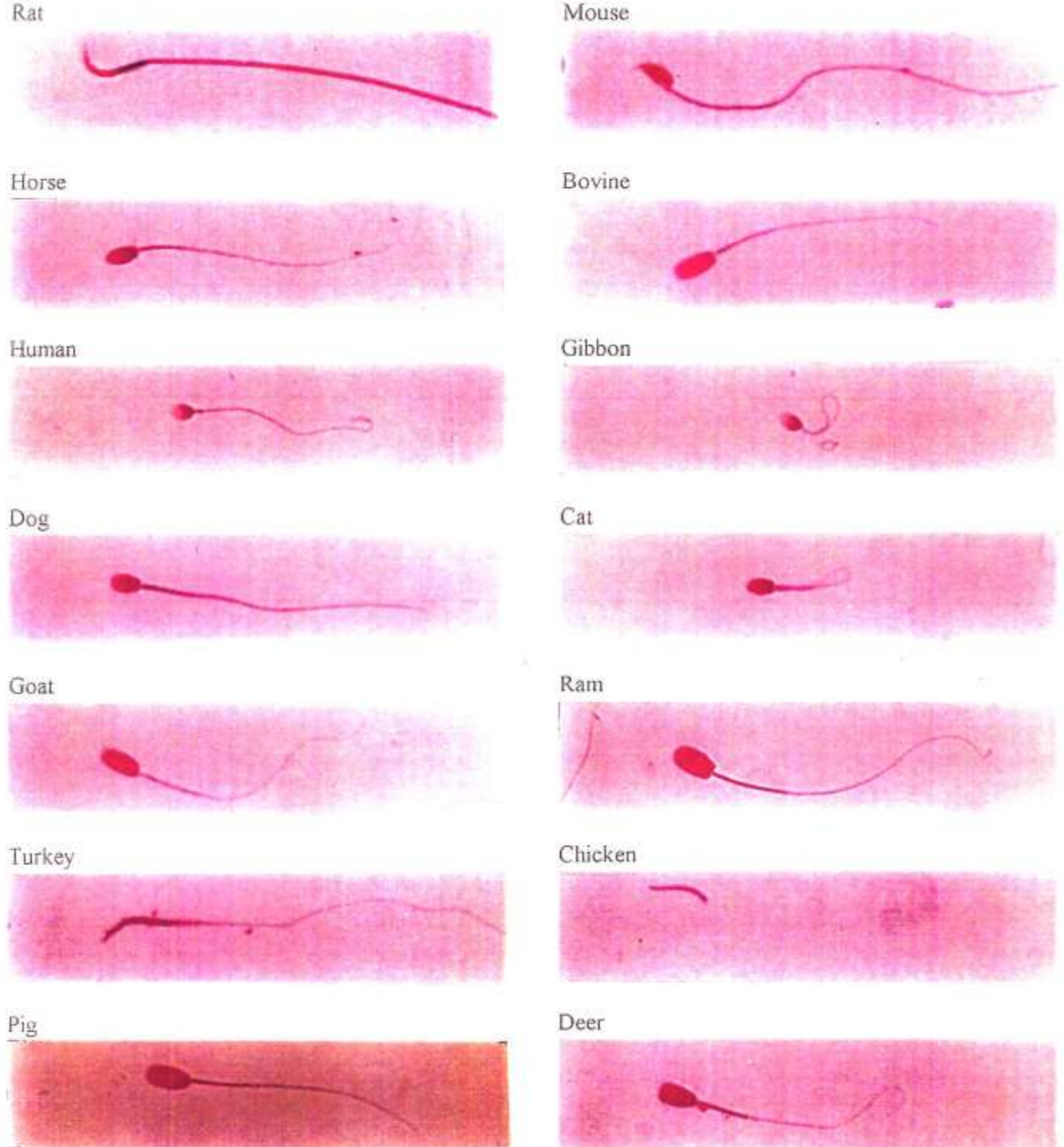
- Motile Spermatozoa ?!

Canvess S, Choudhury A, Sensabaugh G, Hospital wet mount examination for the presence of sperm in sexual assault cases is of questionable value, J Forensic Sci, 2014, Vol 59 No 3, 729-734

- Sperm morphology – complete

- Disintegrated sperm heads

IDENTIFICATION SPECIES



BLOOD

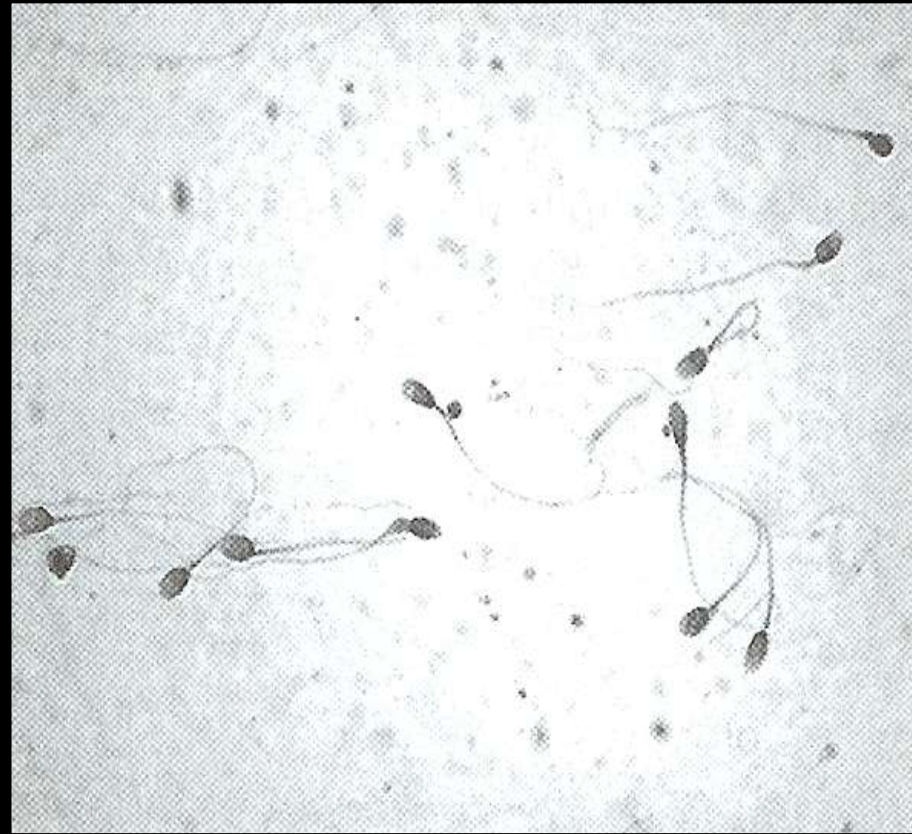
- Blood or not
 - Phenolphthalein test, Luminol test
- Human or not? – RBC, Antigens.....
- Blood group?
- DNA identification

Confirmatory tests

Blood



Semen



Hair

- Hair or Not – fibre – synthetic /natural
- Human or not
- Age
- Sex
- Which part of body
- Natural fall or traumatic
- Whose – Victim / Accused

Innocent people convicted from flawed hair evidence

FBI ADMITS ERRORS IN 90 PERCENT OF HAIR AND FIBER CASES, INCLUDING 13
IN WISCONSIN.

Dee J. Hall, Wisconsin Center for Investigative Journalism

Published 12:04 a.m. CT April 30, 2017 | Updated 6:12 a.m. CT April 30, 2017

Other evidences

- Lubricant
- Saliva – Amylase test
- Fecal matter

Is presence of injuries a must??

- **WHO evidence** – 30%
Bowyer L, Dalton ME. *Fem*
ObstetGynaecol.1997;10
- **CEHAT evidence** (ht
19% body injuries, 38% g
- **23% cases only had injur**
:Female Genital Injuries I
Vaginal Intercourse, *Fore*
- **Unconscious** – drug,
- Explanation 2 to Section
no physic
- **WCD** guidelines - in CSA

Guidelines for
medico-legal care
for victims of
sexual violence



WORLD HEALTH ORGANIZATION
GENEVA

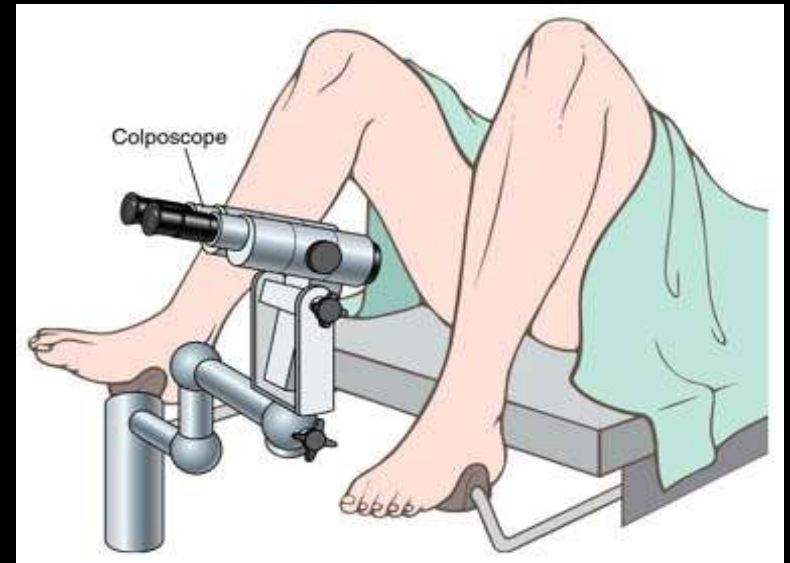
Court rulings on injuries

Lower Courts & High Courts

- Physical injuries
- Genital injuries
- Hymenal injuries

Mitra D, Satish M, Testing Chastity, Evidencing Rape; Impact of Medical Jurisprudence on Rape Adjudication in India, Economic & Political Weekly, 2014 Vol XLIX NO 41, 51-58

Colposcopy



- Magnification / Photo & or Video / Green & white filters
- Introitus, vaginal, cervical – abrasions, lacerations, contusions

X David J. Templeton, Angela Williams, Current issues in the use of colposcopy for examination of sexual assault victims, *Sexual Health* 04/2006; 3(1):5-10 ----- Child V Adult

✓ L C Lenahan, A Ernst, B Johnson, Colposcopy in evaluation of the adult sexual assault victim. *Am J Emerg Med* 1998 ; 16:183-184
----- colposcopy V visual exam

Toluidine blue dye test



Clothes

- Vaginal Fluid / Vaginal Cells / Anal cells / Feacal Matter / Blood / Lubricant / Saliva / Body fluid/ Semen
- Clothes seized
 - When - Immediately/ Delayed
 - Which - worn at time of incident / exam
 - What - outer clothes / inner clothes.....chain of custody
- Clothes packed – contamination Folding/Packing
 - destruction air drying
- Effect of washing of clothes – Semen?

Limitations of Medical Evidence?

- When was the examination done? Documentation
- Mucosal injuries
(<http://pediatrics.aappublications.org/content/116/2/506.long>)
- Healing of injuries
- Post assault activities – Urination/ Defecation ??, Washing, douching, bathing!!!!
- Use of Condom which is not recovered

No medical evidence **DOES NOT MEAN** No Offence

Documentation as evidence???

Past sexual practices

- Two finger test
- Old hymenal injuries
- Past Pregnancies / Abortions / Contraceptive practices / Last consensual sexual intercourse

When relevant

- Chronic sexual abuse
- If within one week - consensual sexual intercourse

Photographs – body injuries/ genital injuries???

THE TIMES OF INDIA, BANGALORE
WEDNESDAY, OCTOBER 15, 2014

TIMES NATION

11

All 5 accused convicted in BPO employee's rape case

DNA Report & 57 Witnesses Nail Them

Sana.Shakil@timesgroup.com

New Delhi: Four years after a 30-year-old call centre employee was abducted from south Delhi's Dhaula Kuan and gang-raped by five men, a trial court on Tuesday convicted all five in the crime.

The court said the DNA report had established that all the accused had raped the woman, who hails from the Northeast. Apart from forensic evidence, additional sessions judge Virender Kumar Bhat relied on the testimonies of 57 prosecution witnesses and said the evidence was credible and trustworthy.

The court will hear arguments on sentencing of the men on October 17. The minimum prison term they can get is 10 years and the maximum, life imprisonment.

The court said the survivor identified the rapists, did not falter at any point and stood her ground throughout. "The deposition of witnesses is in sync with each other and corroborates each other's version," the judge said. The crime took place on the night of November 23-24, 2010. The survivor was abducted while walking home with a colleague after getting dropped in an office vehicle.

FLASHBACK

Nov 24, 2010: Five men abduct a BPO staffer from northeast, takes her to Mangolpuri and gang-rape her

Dec 2-6: All 5 men arrested

Feb 2, 2011: They are charge-sheeted under IPC 376(2)(G) (gang rape), 506 (criminal intimidation) and 365 (abduction)

May 2014: Survivor awarded an interim compensation of Rs 5 lakh by South West District Legal Services Authority, which terms the case 'rare and exceptional'

Jun 2: Final arguments begin

Sep 8: Court reserves its

verdict for September 22

Sep 22: Verdict deferred after one of the five men pleaded innocence and claimed police had tampered with evidence

Sep 24: Court fixes October 10 to pronounce verdict after the prosecution rebutted the claim of an accused that police had planted evidence

Oct 10: Court defers pronouncement of verdict till October 14 saying judgment is not ready

Oct 14: All five pronounced guilty of abducting, gang-raping and criminally intimidating the survivor

CASE IMPACT

It prompts Delhi Police to issue an order to all BPOs in the capital to drop women employees home and provide them security

PCR vans asked to remain visible on roads, one officer told to remain outside the vehicle always

Delhi Police requests government to set up a fast-track court for rape cases

of criminal intimidation and sharing common intention.

After abducting the survivor, they had taken her to Mangolpuri in a three-wheeled cargo carrier, raping her in the vehicle, and dumped her at an isolated spot.

Convicting the five, the court expressed disappointment over the functioning of forensic laboratories, saying they needed to become more organized and do away with their casual approach. "It has become a practice in the FSL not to mention receipt of sample seals along with exhibits in the acknowledgments issued to the person depositing the exhibits... A direction need to be issued to FSL officials to discontinue the practice and mention in every acknowledgment, the number of sample seals deposited along with the exhibits," the court said.

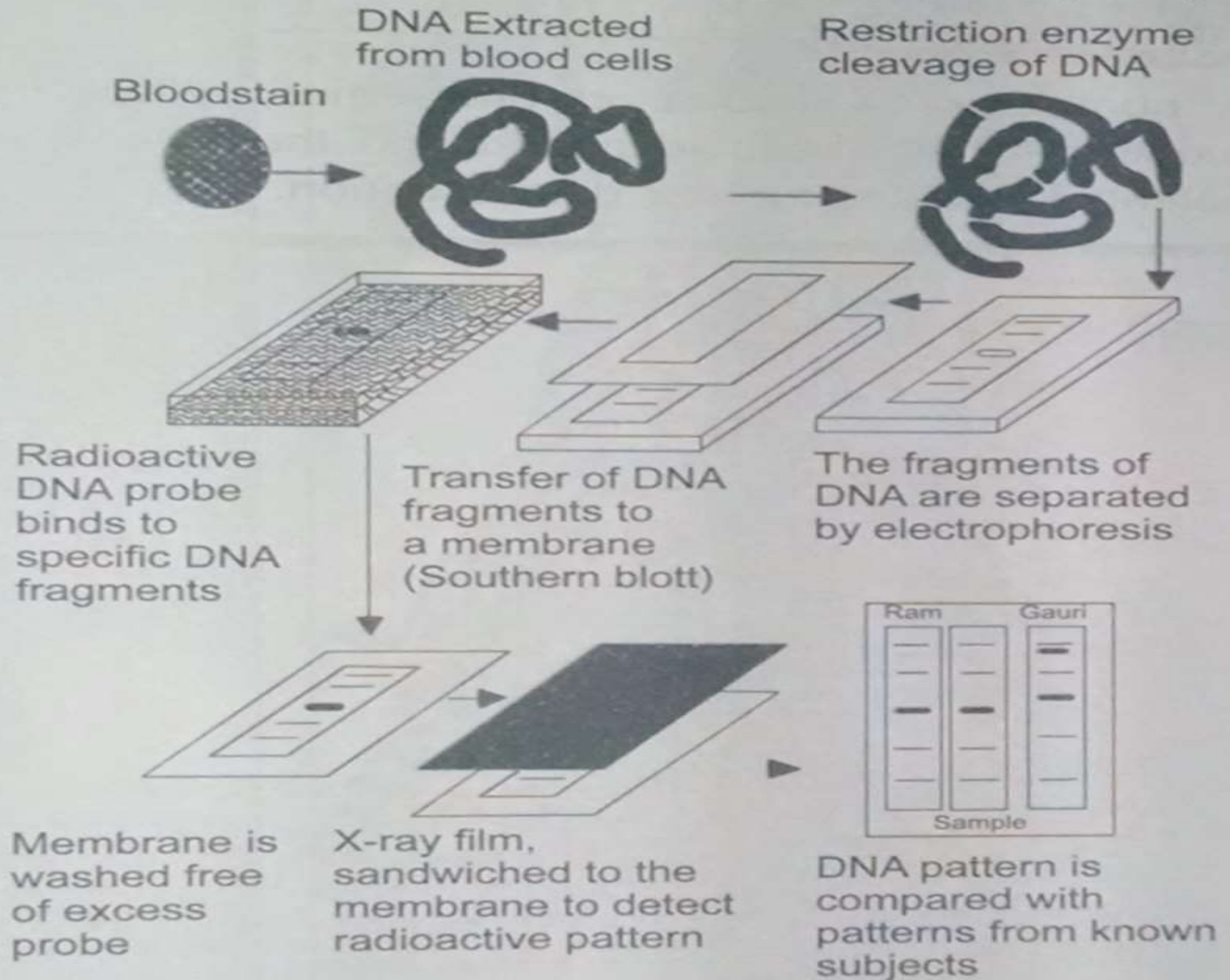
Stating that the prosecution's case had been proved beyond reasonable doubt, the court said the evidence, including the DNA report, established that the woman was abducted and gang-raped first in a moving vehicle and then at a secluded place. "It thus evident that DNA of the accused was found present in the vaginal slides... the court held.

DNA analysis

- Personal genetic blue print
- Positive identification except identical / uniovular twins
- **RFLP** – Restriction fragment length polymorphism
- **PCR** – Polymerase chain reaction



Restriction Fragment Length Polymorphism (RFLP)



Indian Case Laws

- Govind Singh v. state of Madhya Pradesh- SC- fundamental right must be subject to restriction on the basis of compelling public interest
- Khark Singh v. state of Uttar Pradesh 1961- SC- right to privacy is not a guaranteed right under our Constitution.
- N.D. Tiwari case – SC rejected claim of violation of right to privacy & would cause public humiliation. Given in sealed cover

Indian Case Laws

- Priyadarshini Mattoo case- DNA from seminal discharge of accused found on undergarments of victim and her private parts were compared with DNA of accused & they matched conclusively.
- Nirbhaya case - forensic and medical evidence including bloodstained clothes of accused DNA samples matched with that of Nirbhaya
- 2017 – SC – 9 judge bench – Right to privacy a fundamental right

DNA samples

- Sec 164 A CrPC & Sec 53 A CrPC
- Evidence to compare?!
- EDTA vaccutainers – dry gauge – FTA cards?
- Trace evidence on genitals / body / clothes / Scene / Nail clippings / Products of conception / Foetus

DNA

- Workload on FSL?
- Accreditation NABL / JCI
- Private labs / Defense labs
- **Pascal's case / Baduan case????!!!!!!!!!!!!!!**
DNA not matching to the Victim/survivor

DNA samples

- Non matching of DNA – ?????..... False case
- Improper sample

Maternal / Fetal tissue, Spouse / accused semen

- Denatured sample

Formalin fixed / Heated / Sunlight / Cold chain **XX**

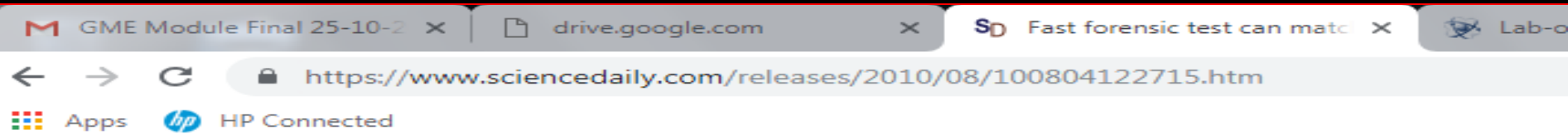
- Contaminated sample

Pre sterile swab / Touch DNA

DNA samples

- 16 loci **V** 24 loci match
- Reporting ? Statistical probability?!
- DNA typing **DNA database**????????????
- ? **Human DNA Profiling Bill 2015 /**
DNA Technology (Use & Application)
Regulation Bill 2018???

Fast DNA testing



SD Health ▾ Tech ▾ Enviro ▾ Society ▾ Quirky ▾

Science News

from research organizations

Fast forensic test can match suspects' DNA with crime samples in four hours

Date: August 5, 2010

Source: American Chemical Society

Summary: A newly developed test could make checking DNA from people arrested for crimes with DNA samples from crime scenes stored in forensic databases almost as easy as matching fingerprints. With the test, police could check on whether a person's DNA matches that found at past crime scenes while suspects are still being processed and before a decision on whether to release them on bail.

Share:      

RELATED TOPICS

Health & Medicine

- > Forensics
- > Genes
- > Human Biology

FULL STORY

A newly developed test could make checking DNA from people arrested for crimes with DNA samples from crime scenes stored in forensic databases almost as easy as matching fingerprints. With the

Sexually Transmitted Infections

- Locard's principle of exchange – if one of them is harbouring infection or disease
- Incubation period – Gonorrhoea / Chlamydia / HIV / Hepatitis / Syphilis / Herpes
- Minimum two examinations
 - first examination as early as possible
 - second after incubation period
- Penile contact V Fomite transfer
- Penis / Objects / Body parts – Sexual offence

Pregnancy & its Complications

- Issues with consent – MTP - Age / Person
- Issues with products of conception / foetus
- Authorisation- DNA - Rape / disputed paternity
- Cold storage
- Chain of custody
- Complications -Anaemia / Infection / Infertility / Psychological consequences

Evidence of treatment

- Pain, infection, depression...
- documentation in case sheets / discharge summaries / prescription sheets / pharmacy bills, etc.

Lie detectors

- Badaun gang-rape

Accused clear lie-detection test: CBI

Wednesday, 6 August 2014 - 6:28pm IST | Agency: PTI

- Badaun Rape Case:

Key Witness Fails Lie-detector Test

By Express News Service Published: 18th September 2014 06:05 AM

- Judge Orders **Rape Survivors to Take Lie-Detection Test**

March 19, 2010 Cleveland, Ohio Juvenile Court Judge Alison Floyd

Polygraph Instrument (Lie Detector)



Lie Detector

- BP – Blood pressure
 - Pulse
 - RR- Respiratory rate
 - GSR /skin conduction
 - Irrelevant / Relevant / Control questions
- X** – psychotic personality, over reactive personality,
Drug addicts, restless, Noncooperative people

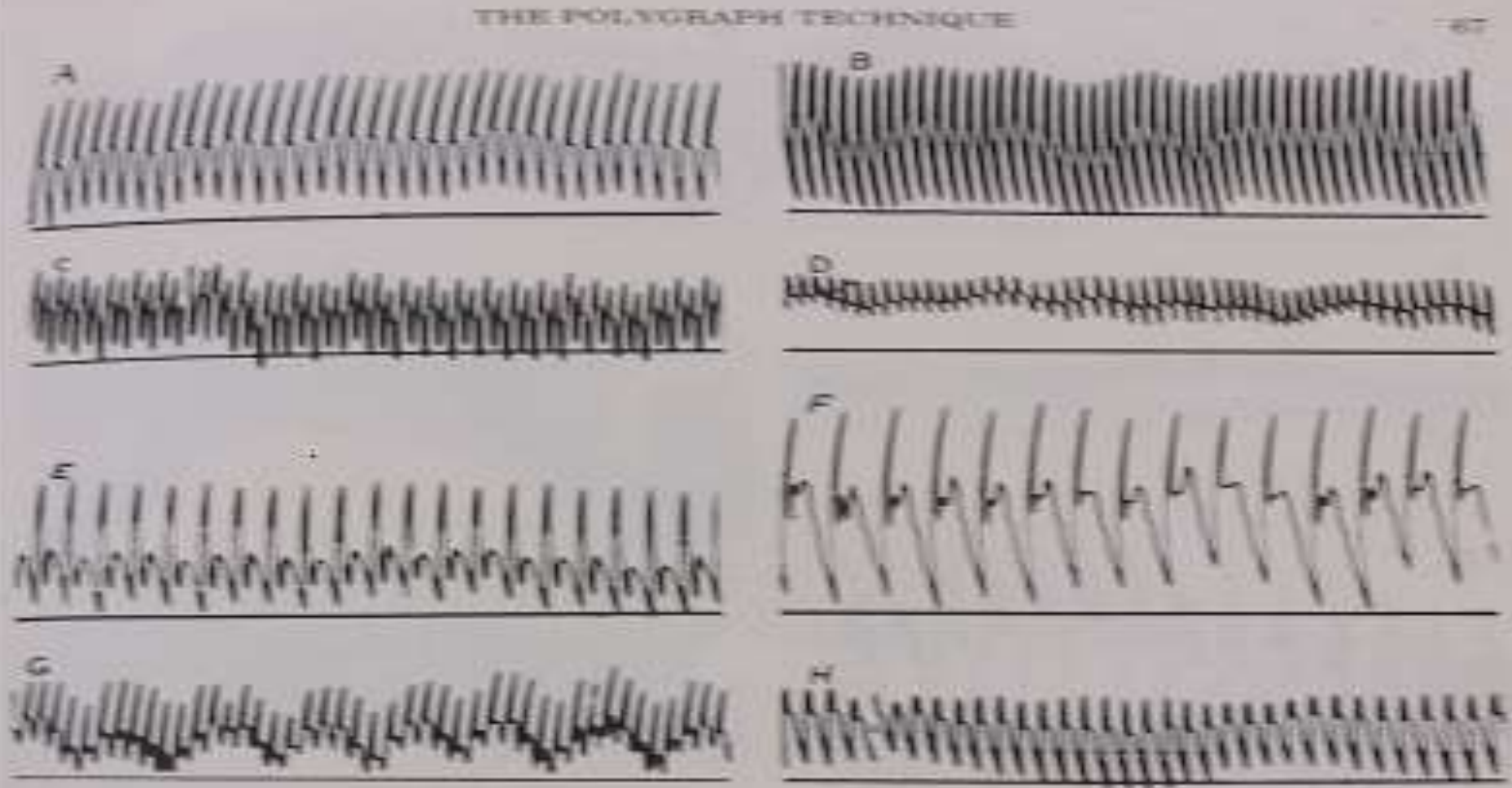
Polygraph Attachments



Computerized Polygraph Lab

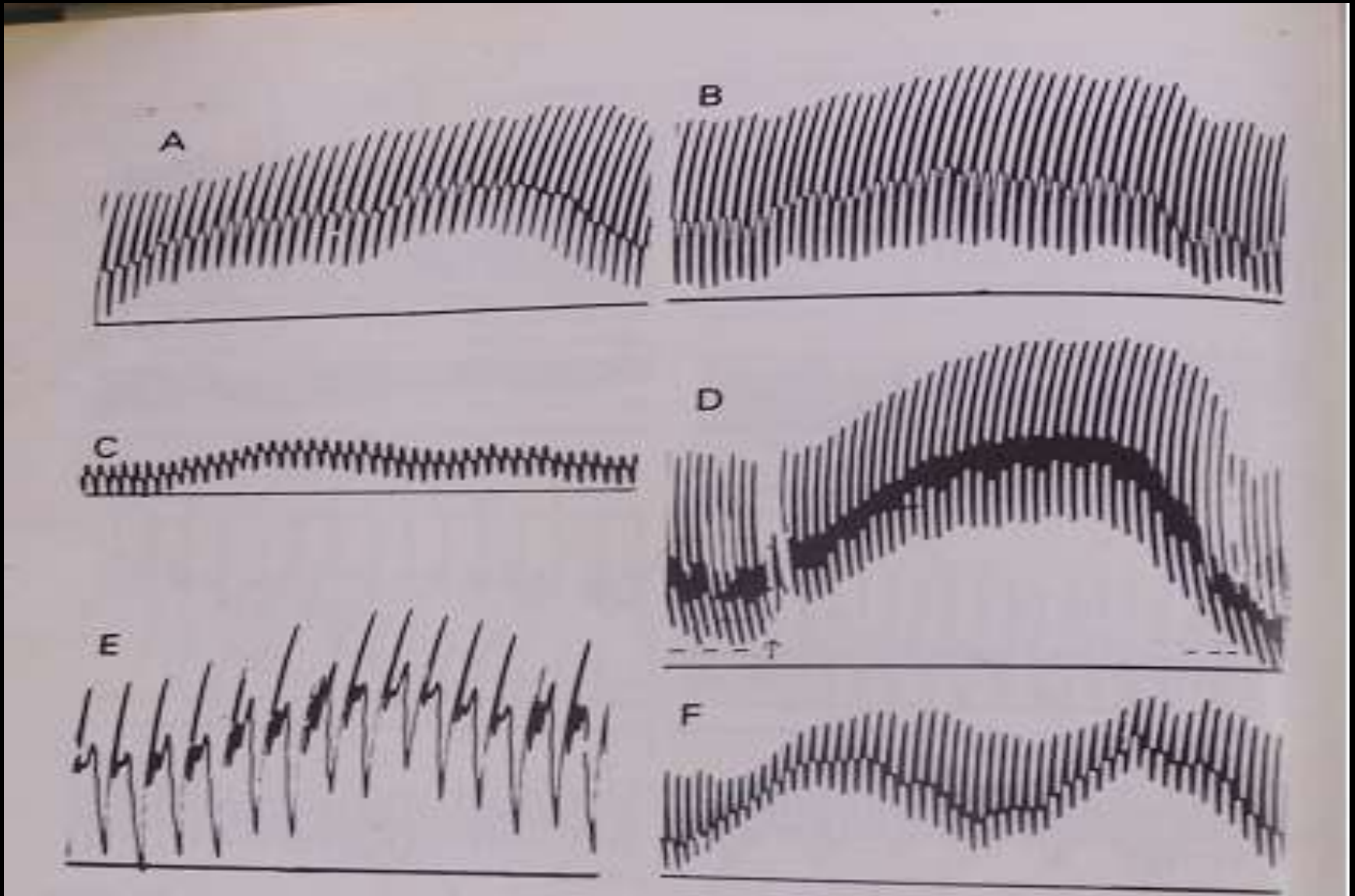


Normal (Non Deceptive) Blood Pressure Pulse Patterns



Each individual stroke in this tracing represents a heartbeat within a range of normal acts 80 beats per minute. A stroke of this amplitude (3/4 inch) with the dicrotic notch near the center is an ideal for deception testing purpose.

Blood pressure deception criteria



A typical deceptive response as indicated by a rise in the base level of the tracing. It reflects an increase in blood pressure after a question is heard

What if polygraph instrument was wrong!

- Yes in USA polygraph machine was wrong
- The manufacturer came forward
- The convicts were released.
- Can it occur in India????????????????

Narcoanalysis

http://www.sciencedirect.com x Speed Dial x Asaram Bapu Rape Case: S x http://www.biolreprod.org x MTS MBlaze x
www.ibtimes.co.in/asaram-bapu-rape-case-self-styled-godman-to-undergo-narco-test-505554

INTERNATIONAL BUSINESS TIMES

THURSDAY, 16TH OCT

News Business Technology Sport Entertainment Science & Health Life & Style



Society

Asaram Bapu Rape Case: Self-Styled Godman to Undergo Narco Test?

By Debasree Purkayastha September 12, 2013 13:10 IST

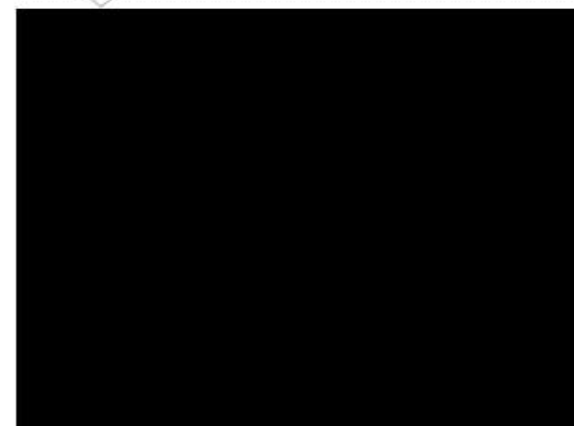


Asaram Bapu, the self-proclaimed godman who was recently arrested on rape charges, sparked another controversy after the victim's father sought for a narco analysis test to be conducted on the accused.

For more information call
800 36227 (UAE)
+971 4 366 1688 (International)

Asaram, who is currently in jail, was taken to MDM Hospital, Jodhpur on 9 September, for several tests which includes Magnetic Resonance Imaging (MRI) and Electrocardiogram (ECG).

IBTIMES TV



Authorities Decontaminate Apartment Co

Narcoanalysis

- At a point very close to unconsciousness
- Subject will be mentally incapable of resistance to questioning &
- Incapable of inventing falsehoods that they used to conceal their guilt
- Sodium pentothal IV

Selvi V State of Karnataka

(2010 (7) SCC 263)

- Lie detection test
 - Brain mapping (BEAP)
 - Narcoanalysis
-
- NHRC Guidelines..... Informed Consent
 - Not allowed on Legal grounds.....?? Medical !

Selvi V State of Karnataka

- No Lie Detector Tests should be administered except on the basis of **consent of the accused**. An option should be given to accused whether he wishes to avail such test.
- If accused volunteers for a Lie Detector Test, he should be given **access to a lawyer** and the physical, emotional and legal implication of such a test should be explained to him by the police and his lawyer.
- Consent should be recorded before **Judicial Magistrate**.
- During hearing before the Magistrate, the person alleged to have agreed should be duly **represented by a lawyer**

Selvi V State of Karnataka

- At the hearing, the person in question should also be told in clear terms that the statement that is made shall not be a 'confessional' statement to the Magistrate but will have the **status of a statement made to the police**.
- Magistrate shall consider all factors relating to the detention including the length of detention and the nature of the interrogation.
- Actual recording of the Lie Detector Test shall be done by an **independent agency (such as a hospital)** and conducted in the presence of a lawyer.
- Full medical and factual narration of the manner of the information received must **be taken on record**.

Video goes Viral – Media trial / Public trial before adjudication by Courts

Opera Narco test Telgi names Pa x

www.youtube.com/watch

YouTube IN

7:03

Narco Tape of narco-analysis test done in 2003
Court summons issued after petition by Prof's son

0:10 / 2:33

Narco test Telgi names Pawar on tape

Ashu S.

June 29, 2013



timesofindia.com/city/mumbai/How-narco-tests-gave-more-misses-than-hits/articleshow/20823599.cms

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How narco tests gave more misses than hits

Shibu Thomas & Rebecca Samervel, TNN | Jun 29, 2013, 01:30AM IST

MUMBAI: In the last few years, the city police have used narco-analysis and brainmapping tests as a "secret weapon" against suspects in high-profile cases. However, often the results have been less than satisfactory and in some cases have led to major setbacks.

The Mumbai police's application to conduct narco-analysis on Suraj Pancholi, son of Bollywood actor Aditya Pancholi, who was arrested for allegedly abetting actor Jiah Khan's suicide, has once again brought attention on the much-abused test.

"At times, the police do resort to means, like the narco-analysis tests, as a shortcut to investigation or as a convenient tool to get their way. This should not be encouraged," said criminal lawyer Majeed Memon. "The facts of this case [Jiah's suicide] do not justify subjecting the accused [Suraj] to narco-analysis test and is undesirable."

DISPUTED PATERNITY
DISPUTED MATERNITY

How to solve **Disputed paternity?**

- **Accessibility** of mother with alleged father during the probable time of conception
- **Morphological akinness** of the child with alleged father – complexion, features, etc
- **Atavism** – X parents - ✓ grand parents, great grand parents of paternal side
- Matching of **blood group and type factors**
- **DNA analysis**

Use of ABO blood groups

ABO blood group	Genotype	Possible outcomes	Children
A			
B			

Use of Rh system, MNS, Duffy, Kid,

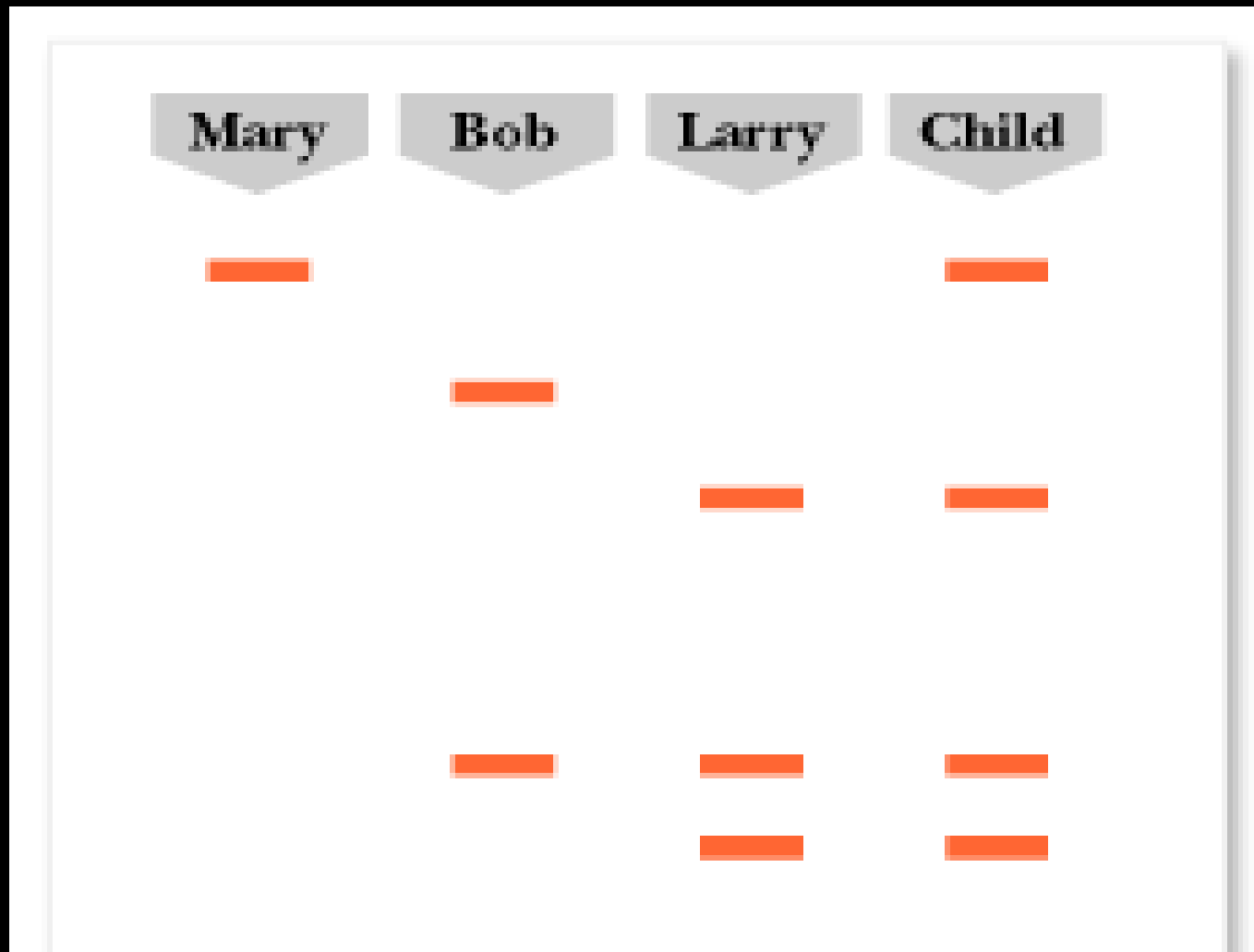
DNA Fingerprinting

- **Extracting** DNA from cells
- **Cutting** up the DNA using an enzyme
- **Separating** the DNA fragments on a gel
- **Transferring** the DNA onto paper
- **Adding** radioactive probe
- **Setting** up the X-ray film



DNA Fingerprinting

mother Accused 1 Accused 2



Disputed maternity

- Accidental exchange of newborns in the hospitals
- Alleged suppositious child
- Exchange of male babies to female ones due to craving for male baby

How to solve **Disputed maternity?**

- **Morphological akinness** of the child with alleged mother – complexion, features, etc
- Matching of **blood group and type factors**
- **DNA analysis**
- **Age of the child** matching to the signs on the claiming mother in relation **to the time of delivery.**

Is it necessary to do age estimation?

- Borderline cases
- Sec 15 (5A) ITPA (Immoral Traffic Prevention Act) 1956
Sec 164A CrPC
- SC judgment in 2013.....Ashwani Kumar Saxena V State of M.P. 2013(I) OLR(SC)-214
Documentary proof of age V Medical age

Is it necessary to do age estimation?

- Only in cases where those documents or certificates are found to be fabricated or manipulated, the court, the J.J. Board or the Committee need to go for medical report for age determination.

SC judgment in 2013.....Ashwani Kumar Saxena V State of M.P. 2013(I) OLR(SC)-214

Is it necessary to do age estimation?

- Sec 94 of JJ Act 2015
 - **Presumption and determination of Age**
- Committee, Board to decide on child's age – decision final
- Reasonable doubt....
- **School records** to prove birth – marks cards
- **birth certificate** given by a corporation / municipal authority / panchayat
- only in absence of above, age shall be determined by an **ossification test** or any other **latest medical age determination test** ... on orders of Committee / Board

Model Rules???

- **Medical Board** – Radiologist, Dentist, Physician
- **15 days** report
- CWC / JJ Board – **lower limit of the range, margin of one year** to the child
- Order – **Conclusive proof of age**

Age estimation

Times of India, 2/12/2016

Bone test not enough to fix age: SC

AIIMS Report & Accused's Claim Of Being Minors At Time Of Crime Rejected

AmitAnand.Choudhary
@timesgroup.com

New Delhi: Holding that a medical test does not give an accurate finding regarding the age of a person, the Supreme Court has held that an accused cannot be declared a juvenile solely on the basis of ossification test result and allowed to evade a jail term.

A bench of Justices AK Sikri and R Banumathi said that a blind and mechanical view regarding the age of a person could not be adopted solely on the basis of medical opinion, and it refused to give credence to a report of AIIMS medical board according to which two murder convicts were minors at the time of committing a crime in 1994.

"Courts have always held



“Medical evidence as to the age of a person, though a very useful guiding factor, is not conclusive and has to be considered along with other circumstances”
SUPREME COURT BENCH

that the evidence afforded by radiological examination is no doubt a useful guiding factor for determining the age of a person, but the evidence is not of a conclusive and incontrovertible nature, and it is subject to a margin of error. Medical evidence as to the age of a person, though a very useful guiding factor, is not conclusive and has to be considered along with other circumstances,” it said.

“It is a well-accepted fact that age determination us-

ing ossification test does not yield accurate and precise conclusions after the examinee crosses the age of 30 years, which is true in the present case,” the court said.

The court was hearing a plea of two convicts who, along with four others, were convicted and sentenced to life imprisonment in a murder case. The two convicts never raised the defence of their juvenility during the hearing in trial court and high court. When the matter reached the

Supreme Court in 2014, the two convicts told the court that they were minors at the time of committing the crime and could not be sent to jail.

Although the apex court agreed to examine the plea of the two convicts, it rejected the appeal of four other convicts and upheld their life imprisonment. As there was no documentary proof of their age, the court had asked AIIMS Delhi to conduct a medical test to ascertain their age.

The report said that their age was between 35-40 years in May 2016. As per the procedure to calculate the age at the time of incident, their age would have been around 15 years. But the bench refused to rely on the findings saying “Court should not take a hyper-technical approach while appre-

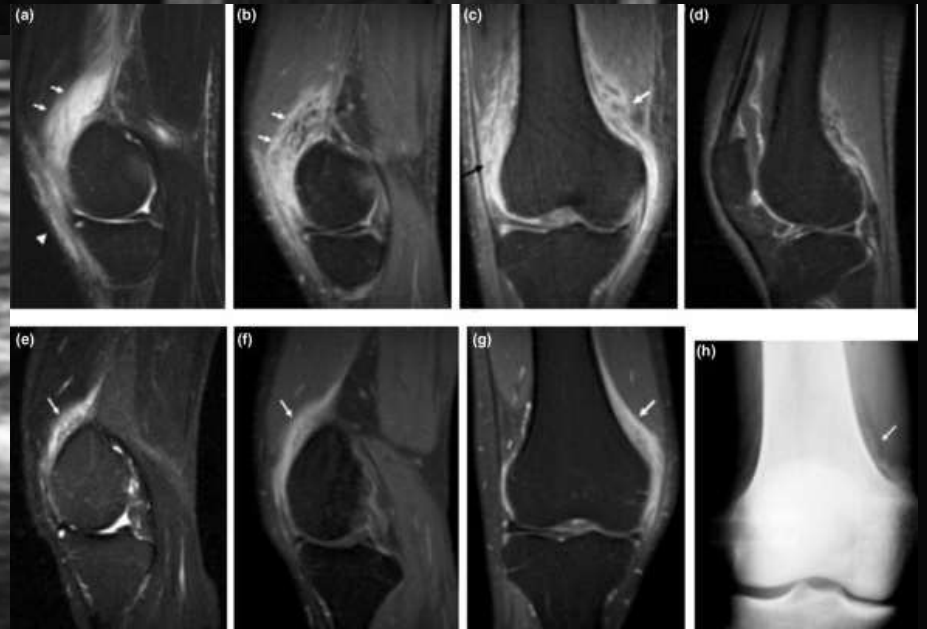
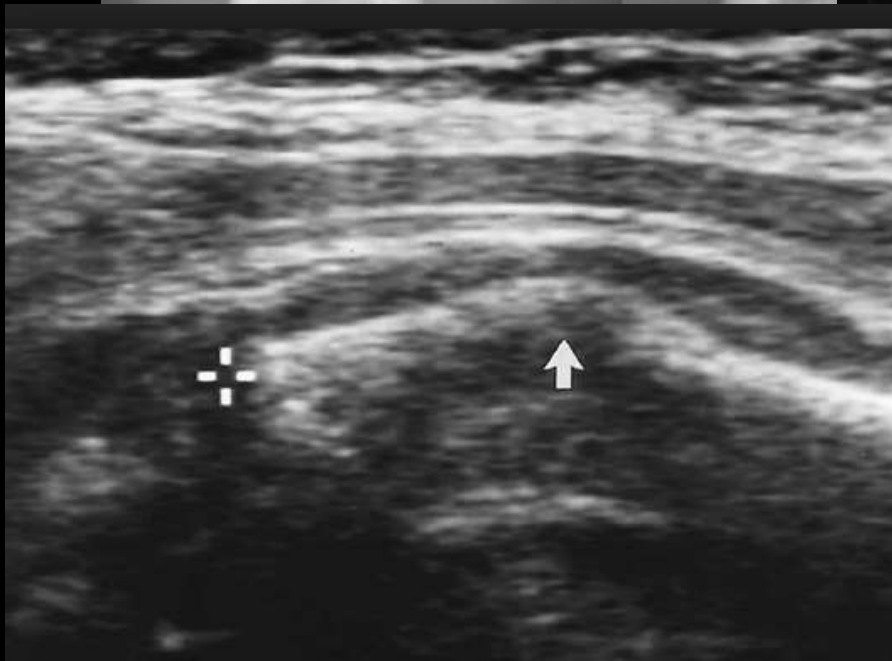
ciating evidence for determination of age of the accused.”

The court pointed out that the accused were involved in about two dozen criminal cases before they committed the murder and that they were produced in lower courts in many cases. It said that had they been minors then the lower court would have treated them accordingly and not as majors.

“Had it been so, the appellant would have been considered as children by their appearance. They would have been dealt with accordingly by juvenile court and the matters would not have been kept pending till this date. This in our view is yet another reason that opinion of medical board cannot be relied upon,” the bench said.

Age estimation

- Ossification tests / Sutures
- Dental eruption / calcifications / translucency
- XraysCT scans / USG / MRI
- Clavicle / 1st rib/ cervical vertebrae / iliac crest / Knee



Age estimation

- Eikvil L et al, **Age estimation in youths and young adults**, A summary of the needs for methodological research and development, Norsk Regnesentral (Norwegian Computing Center, NR) 2012, available at http://www.nr.no/en/nrpublication?query=/file/1355995517/Age_estimation_methods-Eikvil.pdf
- Andreas Schmeling, Pedro Manuel Garamendi, Jose Luis Prieto and María Irene Landa (2011). **Forensic Age Estimation in Unaccompanied Minors and Young Living Adults**, Forensic Medicine - From Old Problems to New Challenges, Prof. Duarte Nuno Vieira (Ed.), ISBN: 978-953-307-262-3, InTech, DOI: 10.5772/19261. Available from: <http://www.intechopen.com/books/forensic-medicine-from-old-problems-to-new-challenges/forensic-age-estimation-in-unaccompanied-minors-and-young-living-adults>

- Bassed RB, Briggs C, Drummer OH. Analysis of time of **closure of the spheno-occipital synchondrosis using computed tomography**. Forensic Sci Int. 2010;200:161–164. doi: 10.1016/j.forsciint.2010.04.009
- Aboshi H, Takahashi T, Komuro T. Age estimation using microfocus X-ray **computed tomography of lower premolars**. Forensic Sci Int. 2010;200:35–40. doi: 10.1016/j.forsciint.2010.03.024
- Ashith B Acharya, Forensic Dental Age Estimation by **Measuring Root Dentin Translucency Area** Using a New Digital Technique, Journal of Forensic Sciences Volume 59, Issue 3, pages 763–768, May 2014

Age estimation

- Telomere shortening with Age
- Age = Relative telomere length $-1.5 / -0.005$
- Effect on Cloning???????
- **Estimating age of humans based on telomere shortening**, Akiko Tsuji et al, Forensic Science International, [Volume 126, Issue 3](#), 23 May 2002, Pages 197–199
- Investigation of telomere lengths measurement by quantitative real-time PCR to predict age, Sudinna Hewakapuge et al, Legal Medicine [Volume 10, Issue 5](#), September 2008, Pages 236–242,

Age estimation by face images

- Crowds, Pubs, cigarettes, adult websites



Identity: ABC

Age: 42

Gender: Male

Race: White

Hair: Short, brown

Moustache: Yes

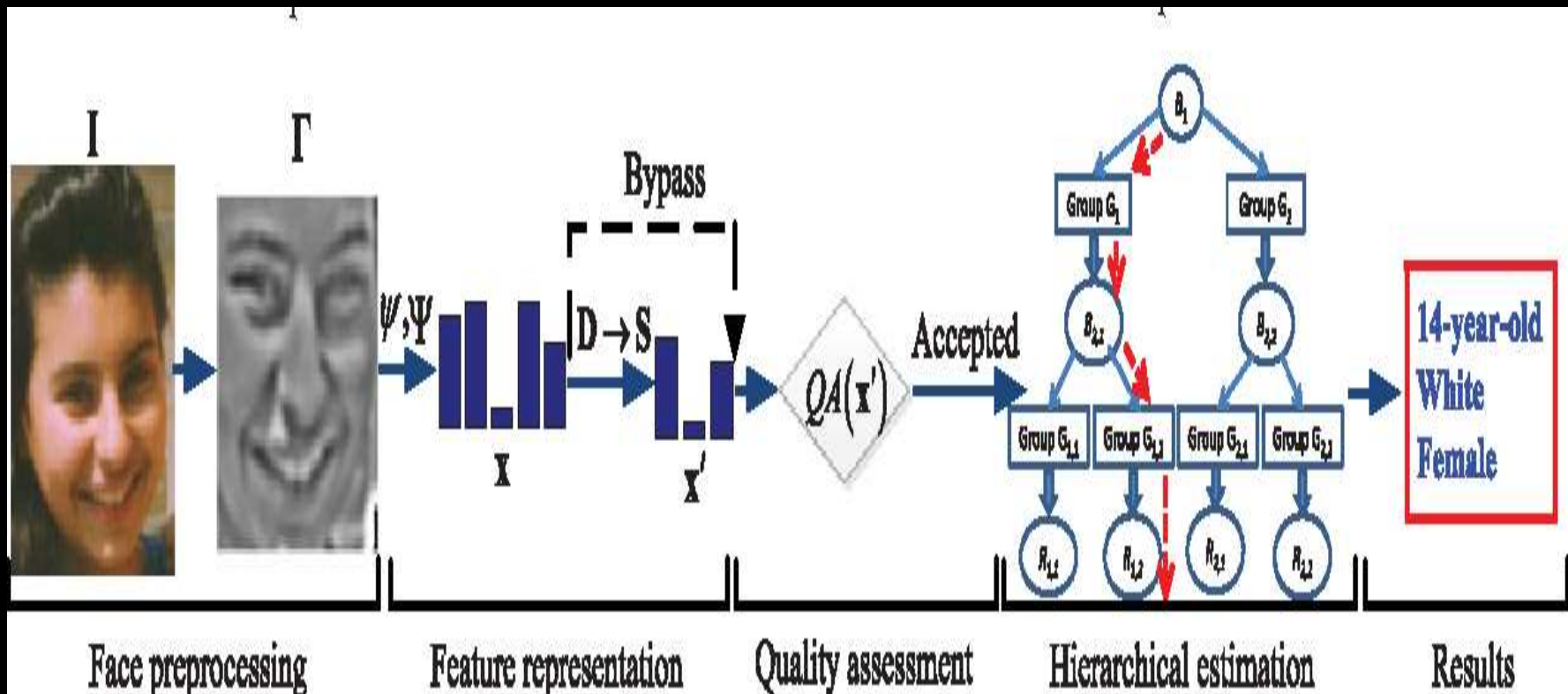
Beard: Yes

Mole: Yes

Scar: Yes



Han, Hu et al. "Demographic Estimation from Face Images: Human vs. Machine Performance." *IEEE Transactions on Pattern Analysis and Machine Intelligence* 37 (2015): 1148-1161.



Sex verification

- Pinki Parmar case
- Duttee Chand case/ Shanti Soundarajan case
- **Isolated test to Combination of tests**
- **10nmol/litre less than male levels of testosterone**
- Jagadeesh N. **Emerging issues in Sex Verification**. In: Gautam Biswas (ed) *Recent advances of Forensic Medicine- 1*, Jaypee publishers, 2015. **p 355-374.**

HERE'S WHAT THE 2018 OLYMPIC GENDER REGULATIONS LOOK LIKE

THE DAILY CALLER
NEWS FOUNDATION

Grace Carr | Reporter

2:28 PM 07/03/2017 | WORLD



The International Olympic Committee (IOC), in charge of making the rules for the 2018 Winter Olympic Games in South Korea, said that there will be no sex or gender testing required for the upcoming games.

“With regard to Hyperandrogenism in female athletes, there were no regulations in place at the Olympic Games Rio 2016 and there will be no regulations in place at the Olympic Winter Games PyeongChang 2018 as we are still awaiting the resolution of the Dutee Chand case,” the IOC wrote in a June email in response to an inquiry into how it would regulate the upcoming Olympics.

Child as Adult

Section 15 JJ Act 2015

- 15. (1) In case of a heinous offence alleged to have been committed by a child, who has completed or is above the age of sixteen years, the Board shall conduct a preliminary assessment with regard to his **mental and physical capacity to commit such offence**, ability to understand the **consequences** of the offence and the **circumstances** in which he allegedly committed the offence, and may pass an order in accordance with the provisions of subsection (3) of section 18:
- **Provided that for such an assessment, the Board may take the assistance of experienced psychologists or psycho-social workers or other experts.**

Can you force a medical examination on the Accused of a Sexual Assault?

- Requisition from minimum of
-Sub Inspector of Police
- Reasonable force as per Sec. 53A CrPC
.....INFORMED REFUSAL
- Medical examination **includes** collection of blood, semen, saliva, hair, body fluids, etc

Is it relevant to document the POTENCY of the Accused?

- Earlier Law – only penetrative assault - Penovaginal
- Now – Fingering / Objects / Non penetrative also
- Sec 53 A CrPC – **doesnot ask** for Potency exam
- Sec 375 IPC – penetrates his penis to **any extent**
- SHOULD WE **STOP** DOING THIS EXAMINATION!!??
Law doesnot mandate / not 100% medical opinion

Mental disease

- Section 84 IPC
- Insane & not Guilty
- At the time of committing offence
- McNaughten rule
- Guilty but Insane

Artificial Intelligence

- Cyanide Mallika case / Serial rapist Umesh Reddy
- Communication between forensic statisticians, crime investigators, lawyers, Judiciary
- Probabilistic reasoning
- Meta analysis
- Chinnikatti SK, Artificial Intelligence in Forensic Science, Forensic Science & Addiction Research, available at <https://crimsonpublishers.com/fsar/pdf/FSAR.000554.pdf>

To Conclude.....

- **Forensic evidence in Civil & Criminal Trials**
- **DNA Profiling**

Acknowledgments/ References

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- Richard Li, Ruth Ballard, Forensic Biology, Lecture 4: Identification of Semen, Available online

THANK YOU

- *Recent advances of Forensic Medicine- 2, Book- Jaypee publishers, 2018 chapter – **Controversies in Forensic Tests, Investigations and expertise***



**Bringing together
Science & Victimology**