# Professor Sir William (Bill) Liley

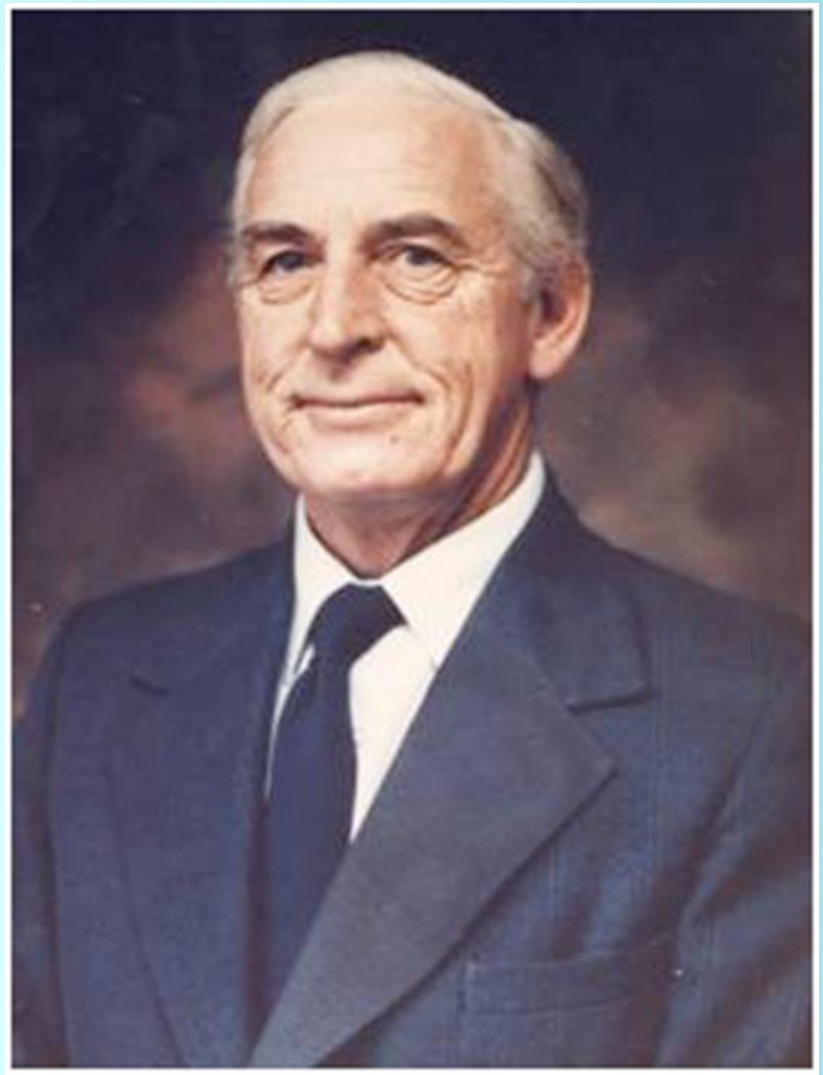
# “Father of Fetal Medicine”

# Courageous Pioneer

# A Man for the time

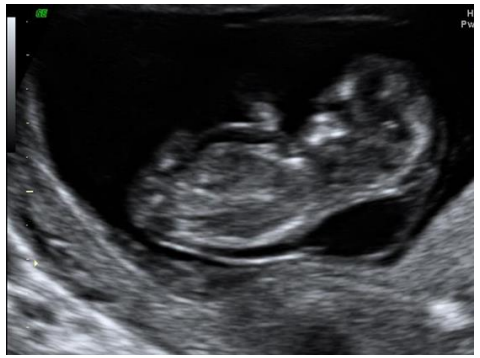
A tale of

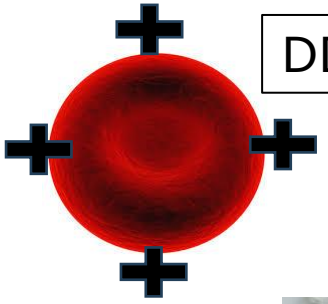
- Brilliance
- Research Environment
- Timing
- Serendipity
- Bravery
- Perserverance



Rh Neg mother

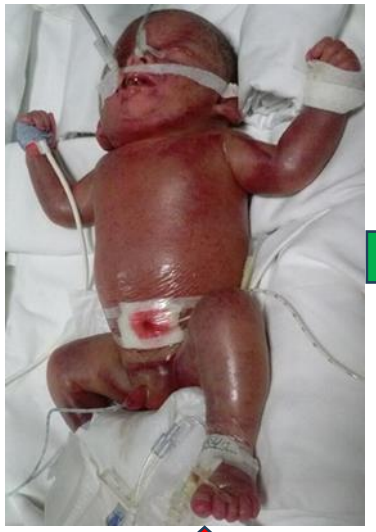
Fetomaternal spill
Of Rh+ve red cells
Or
Rh+ve transfusion

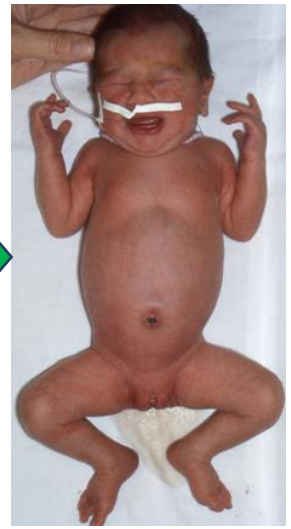




DD or Dd

Haemolytic Disease
Of
Fetus and Newborn

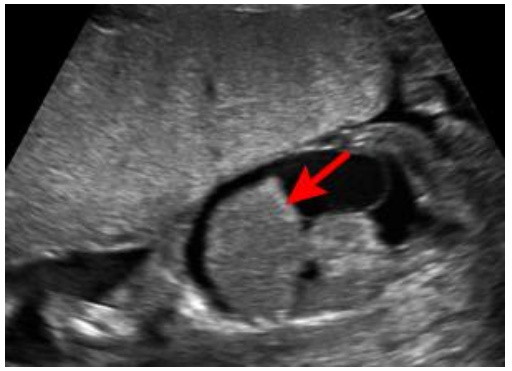


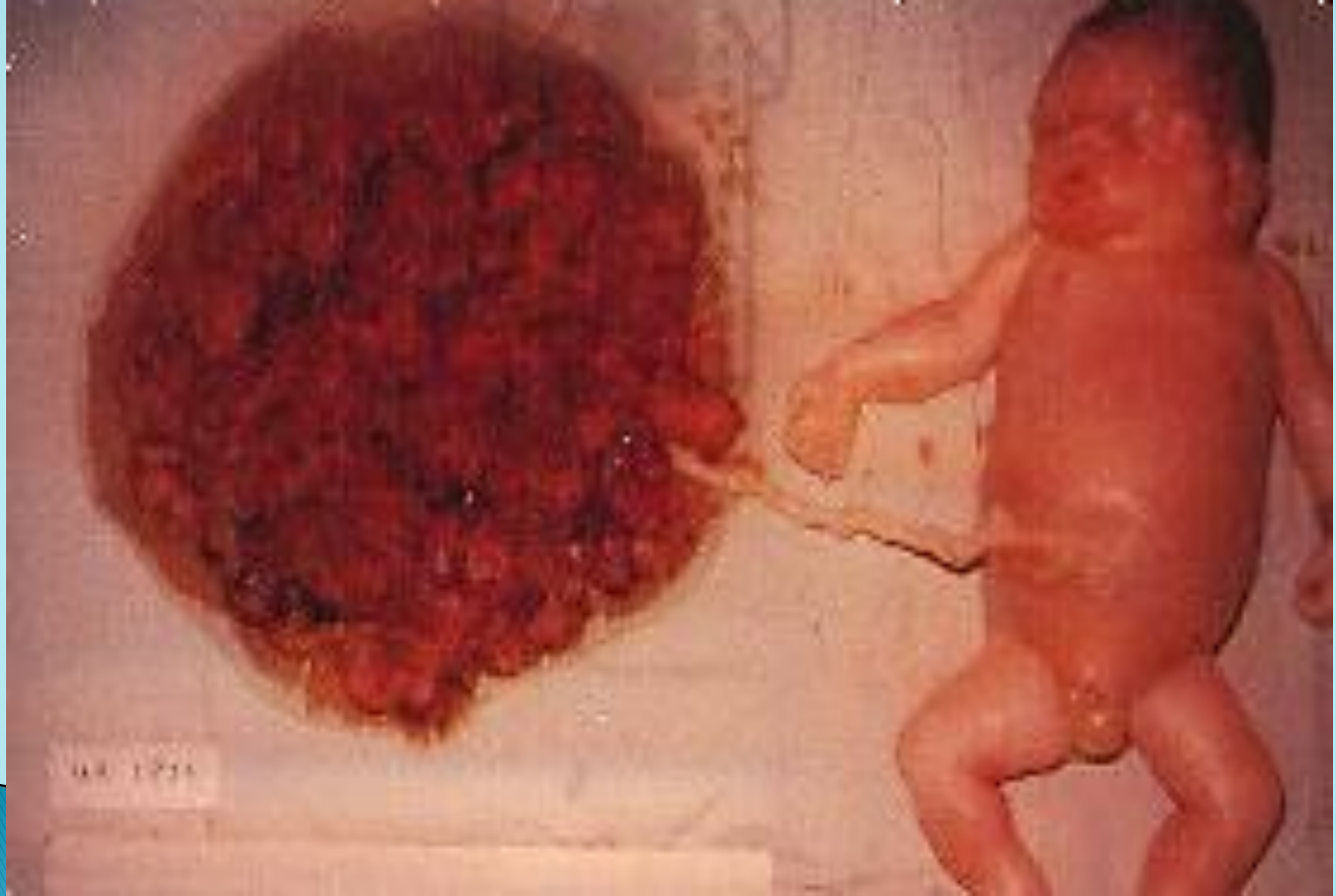


Mother senstised to Rh+ve cells
Makes IgG antibodies

dd

Fetal red cells destroyed
Fetal anaemia
High output cardiac failure
Ascites
hydrops





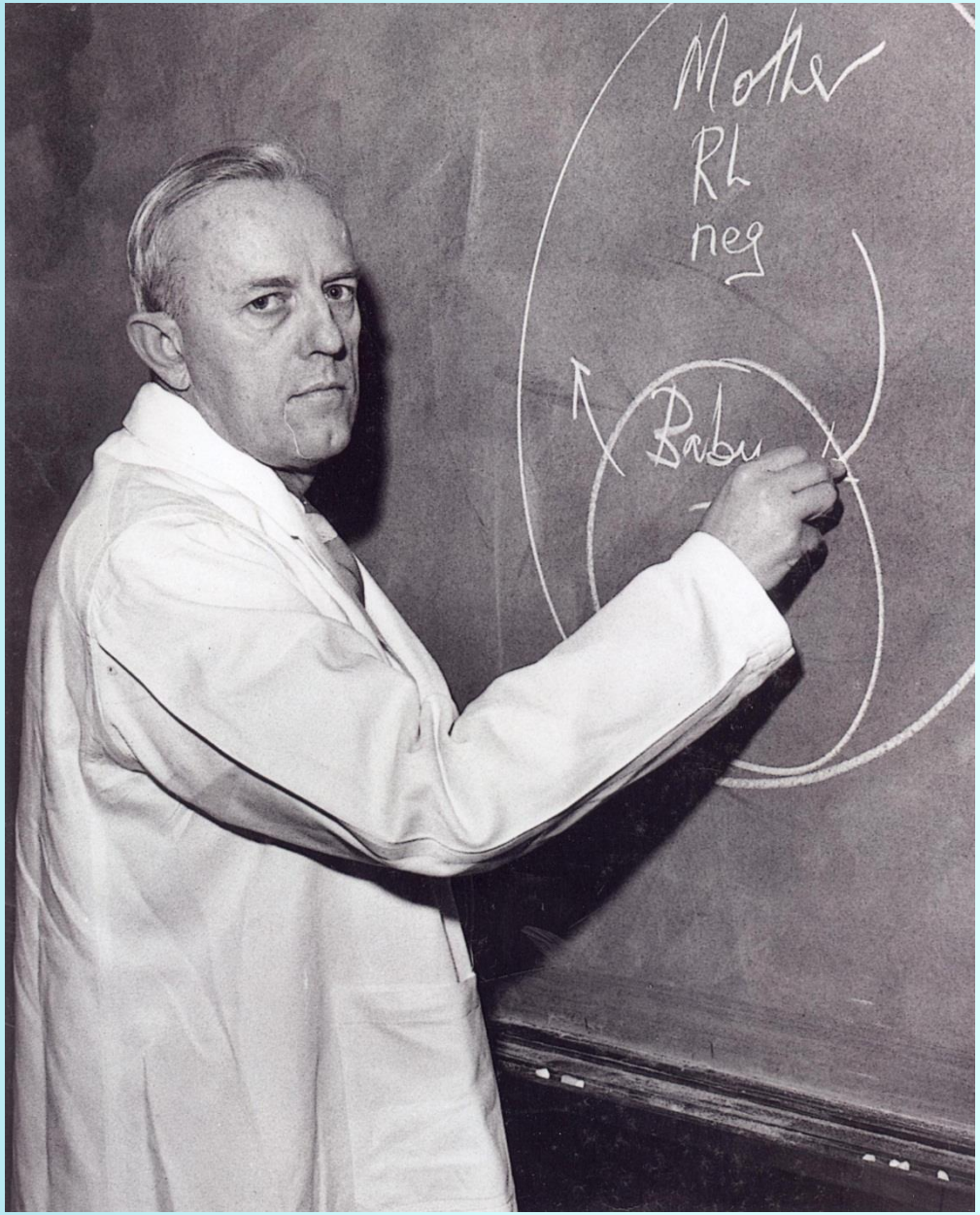
# Rhesus Disease

- **Facts about rhesus disease in up to early 60s**

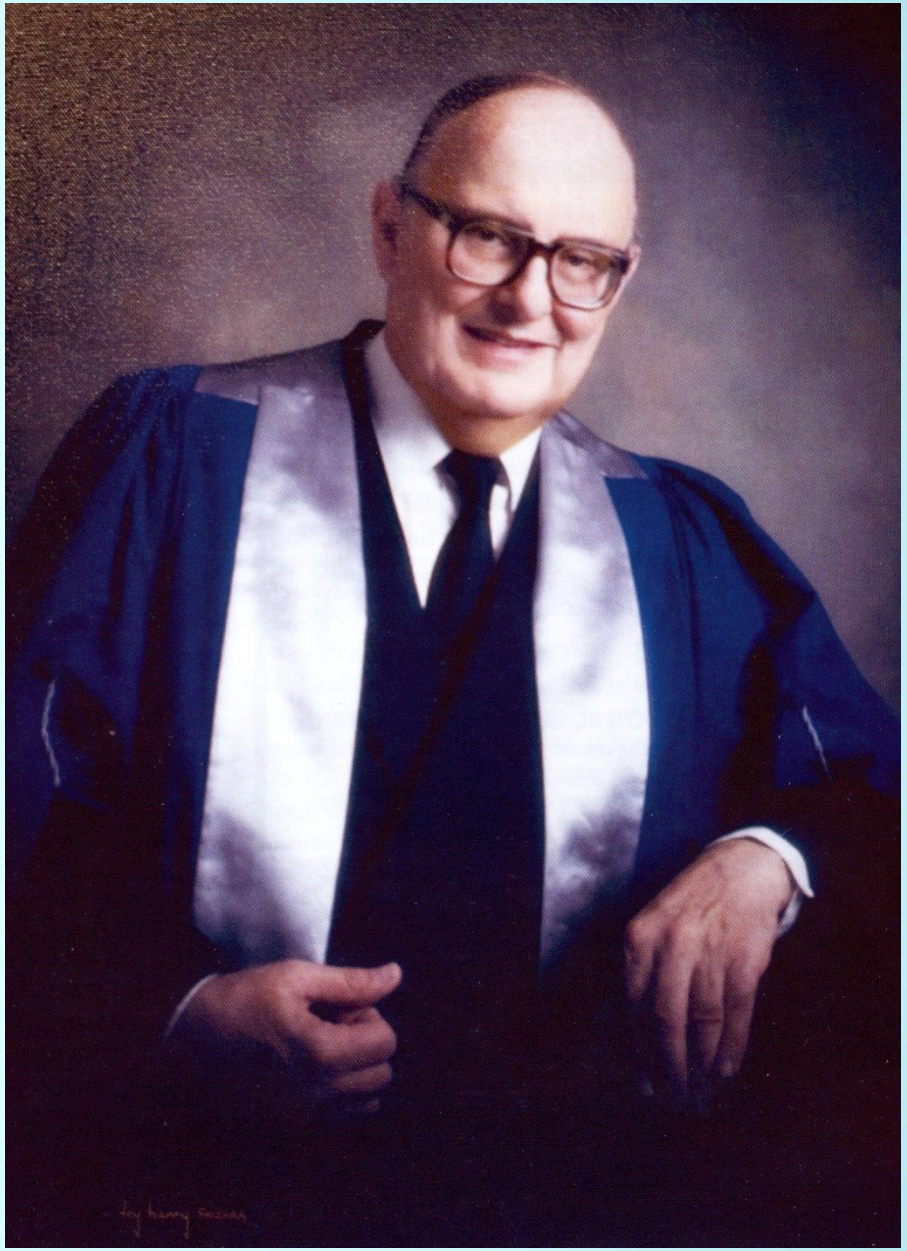
- Standard treatment Rh disease- induction at 38 weeks
- Infant mortality 1949 - 44%

- Perinatal mortality 1959 - 22%
  1962 - 8.7% (after Liley charts)

A leading cause of perinatal mortality before Anti D and safe transfusion




Harvey Carey



Dennis Bonham

# Amniocentesis

- Indications for 200 attempted amniocenteses

| | |
|---|---|
| Haemolytic disease | 141 |
| Haemolytic disease + amniography | 10 |
| Amniography  APH, malpresentation | 36 |
| Investigation preeclampsia | 5 |
| Preeclampsia + amniography | 3 |
| Therapy (relief of hydramnios) | 2 |
| Therapy + amniography | 2 |
| Amnionitis –diagnosis and therapy | 1 |

*Material*

Two hundred amniocenteses were attempted in 151 patients. The indications for these attempts are shown in Table I.

NZMJ 1960

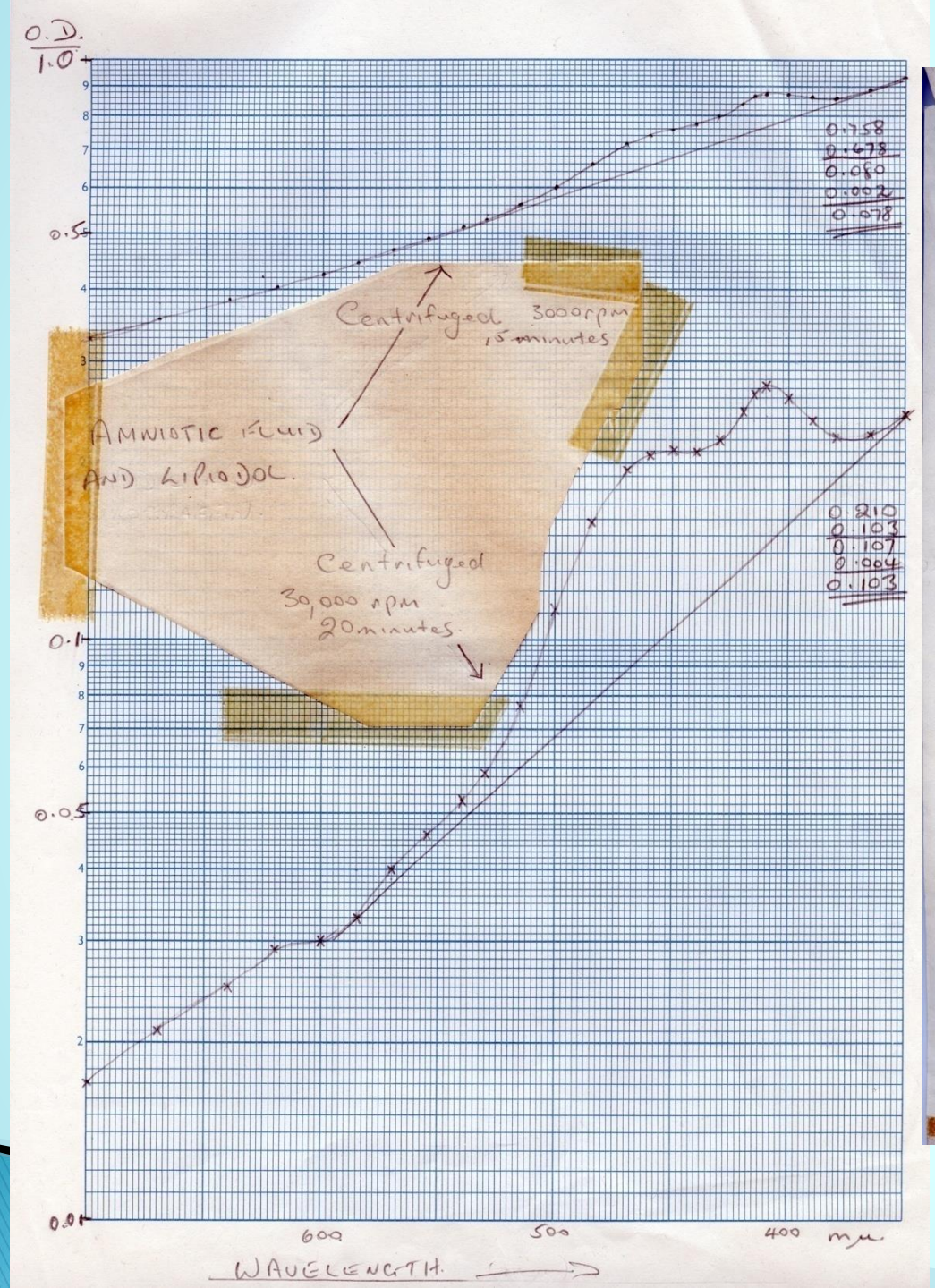
# Amniocentesis

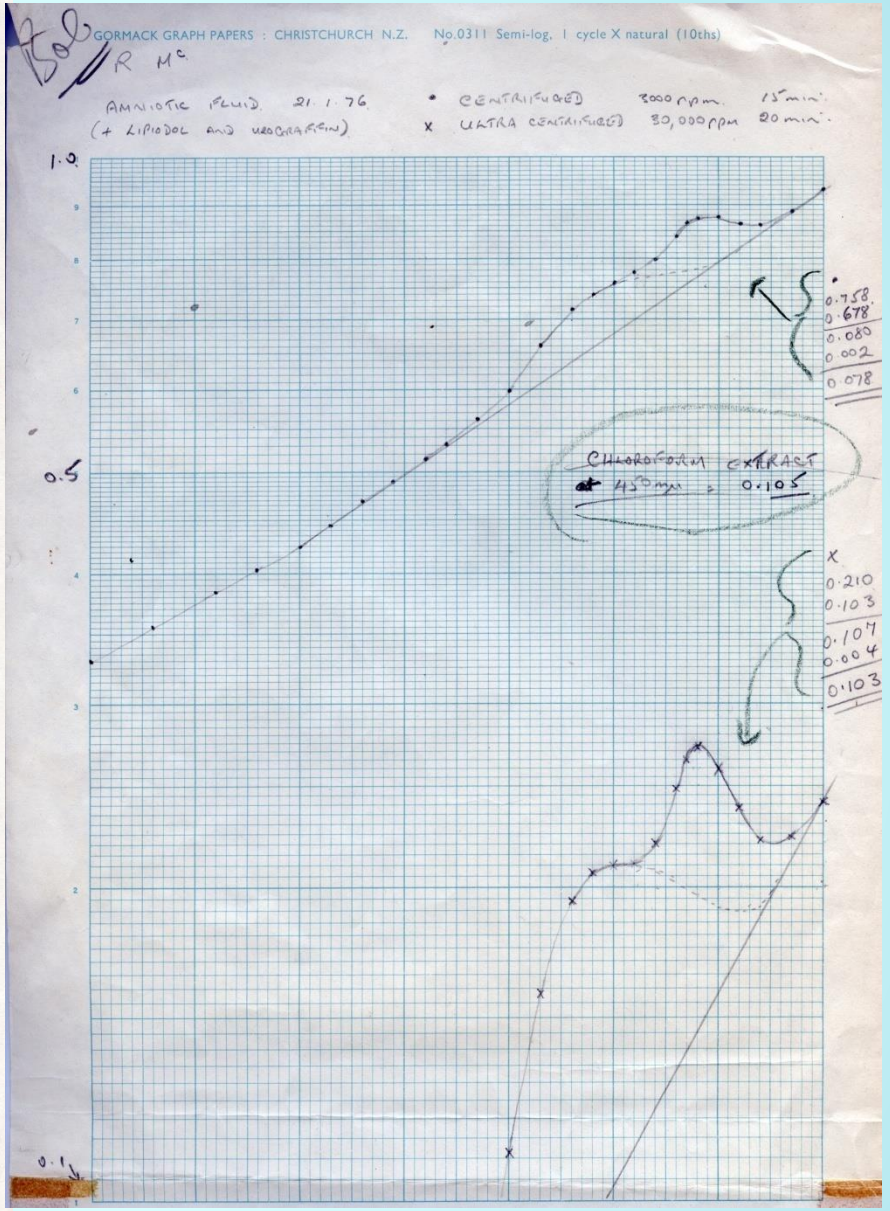
NZMJ 1960

TABLE IV

*Complications Encountered in 200 Attempted Amniocenteses*

| Complication | No of Patients | Specific Sequelae |
|---|---|---|
| Amniotic infection | 2 | (1) Intrauterine death<br>(1) Neonatal death |
| Aspiration of foetal blood | 11 | Nil |
| Perforation of uterine arteries or veins with haemorrhage | 4 | (1, 2) Painless transient leak to liquor<br>(3) Transient leak to liquor and peritoneum—peritonism three days<br>(4) Peritonism four hours<br>Peritonism for two days both patients |
| Leakage of liquor or blood to peritoneum (drainage of hydramnios) | 2 | |
| Small extraperitoneal haematoma | 1 | Local tenderness seven days |
| Injection of a small quantity of contrast medium into foetal subcutanea | 3 | Nil in two babies<br>Slight local bruising in one |
| Injection of a small quantity of contrast medium into uterine wall | 2 | Nil |
| Undiagnosed twins | 2 | Nil |
| Vomiting (once only) during or after procedure | 3 | Nil |



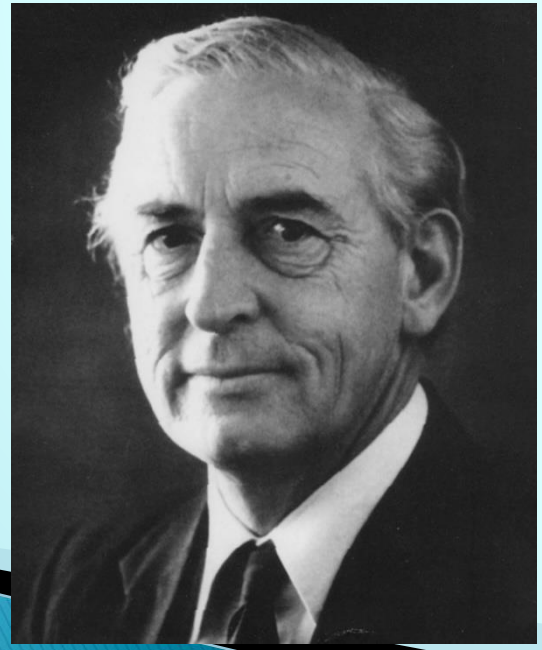



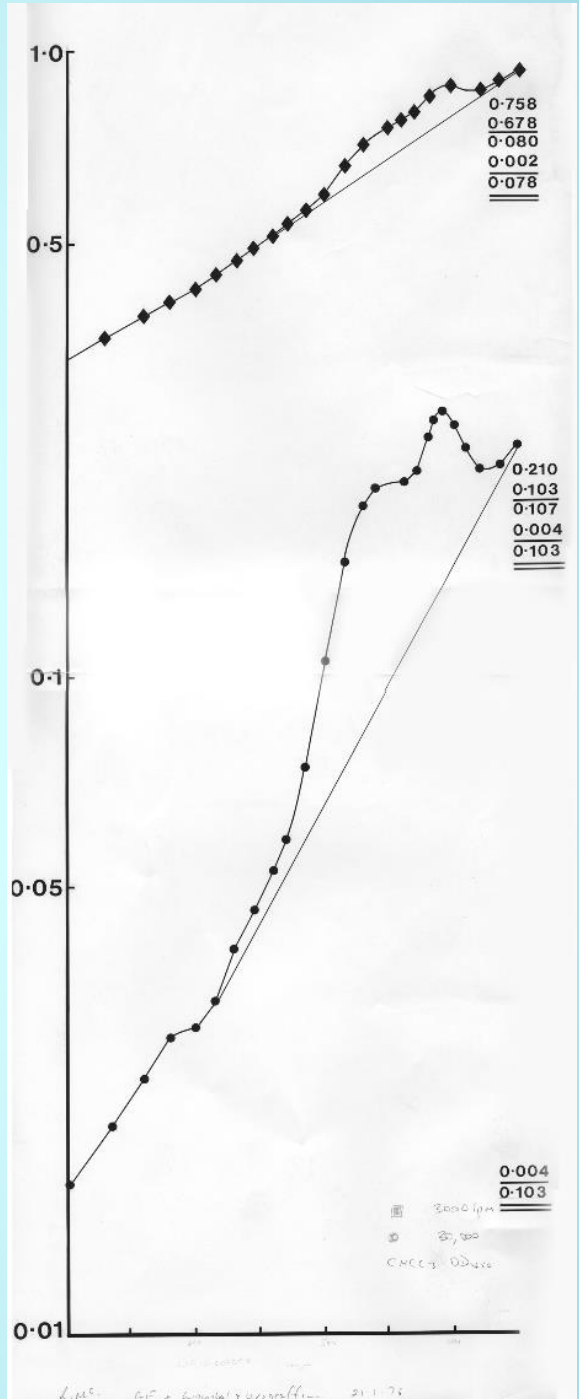

Liley's Raw data for OD Curves

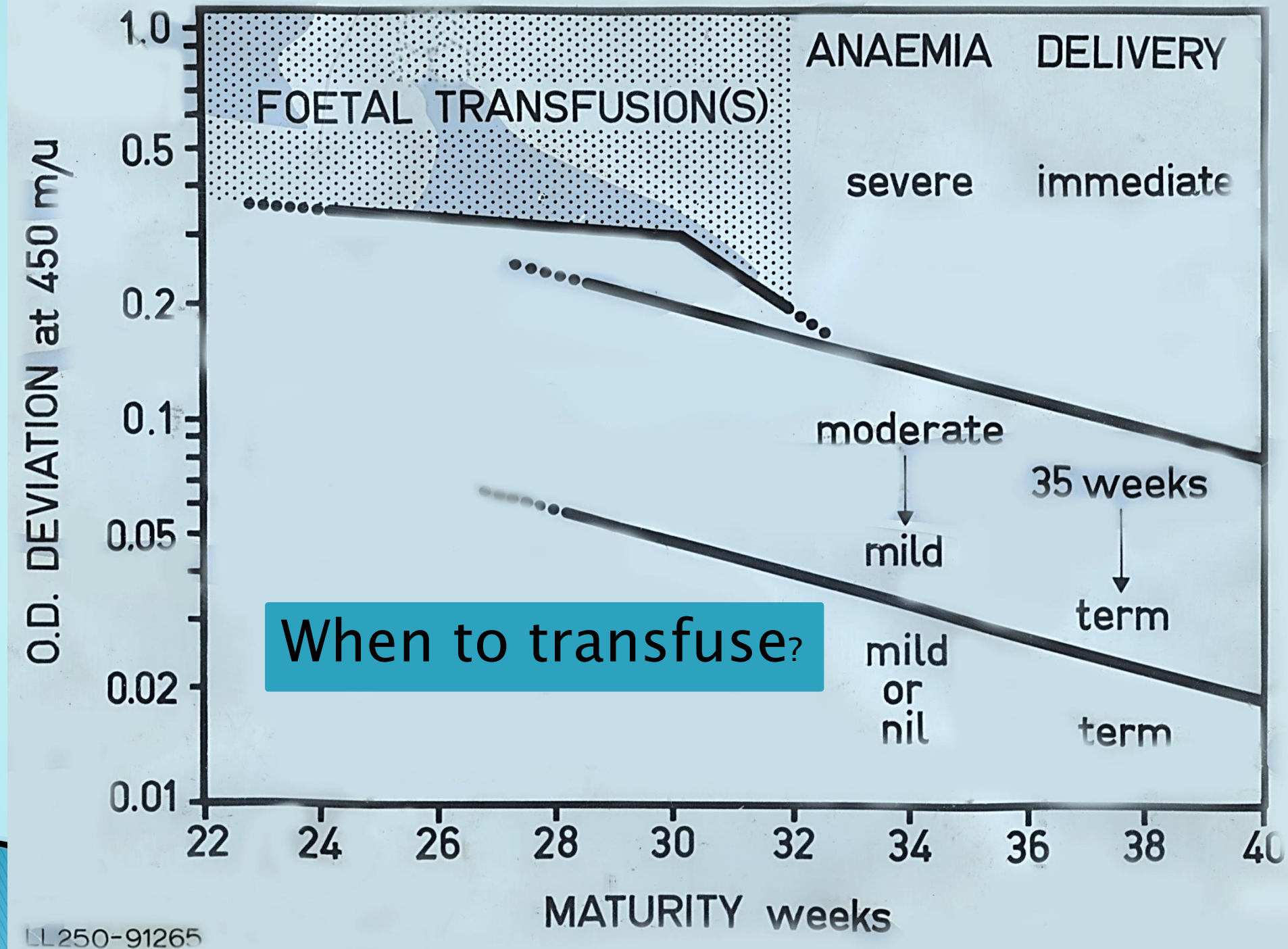
Reprinted from American Journal of Obstetrics and Gynecology, St. Louis.
Vol. 82, No. 6, Pages 1359-1370, December, 1961. (Printed in the U. S. A.)


# Liquor amnii analysis in the management of the pregnancy complicated by rhesus sensitization

A. W. LILEY, M.B., Ch.B., Ph.D.
*Auckland, New Zealand*






FOETAL TRANSFUSION(S)
ANAEMIA
DELIVERY
severe
immediate
moderate
mild
35 weeks
term
mild
or
nil
term
When to transfuse?
O.D. DEVIATION at 450 m/μ
1.0
0.5
0.2
0.1
0.05
0.02
0.01
22
24
26
28
30
32
34
36
38
40
MATURITY weeks
LL250-91265

‘The idea of fetal transfusion originated from two aspects of amniocentesis and one of these was a mishap. . . . .

**Occasionally at amniocentesis I accidentally needled the distended fetal abdomen and obtained fetal ascitic fluid.**

**This had not been intended and initially was rather disconcerting**

but it did not appear to disturb the fetus’.

Tovey, Transfusion Medicine 1992

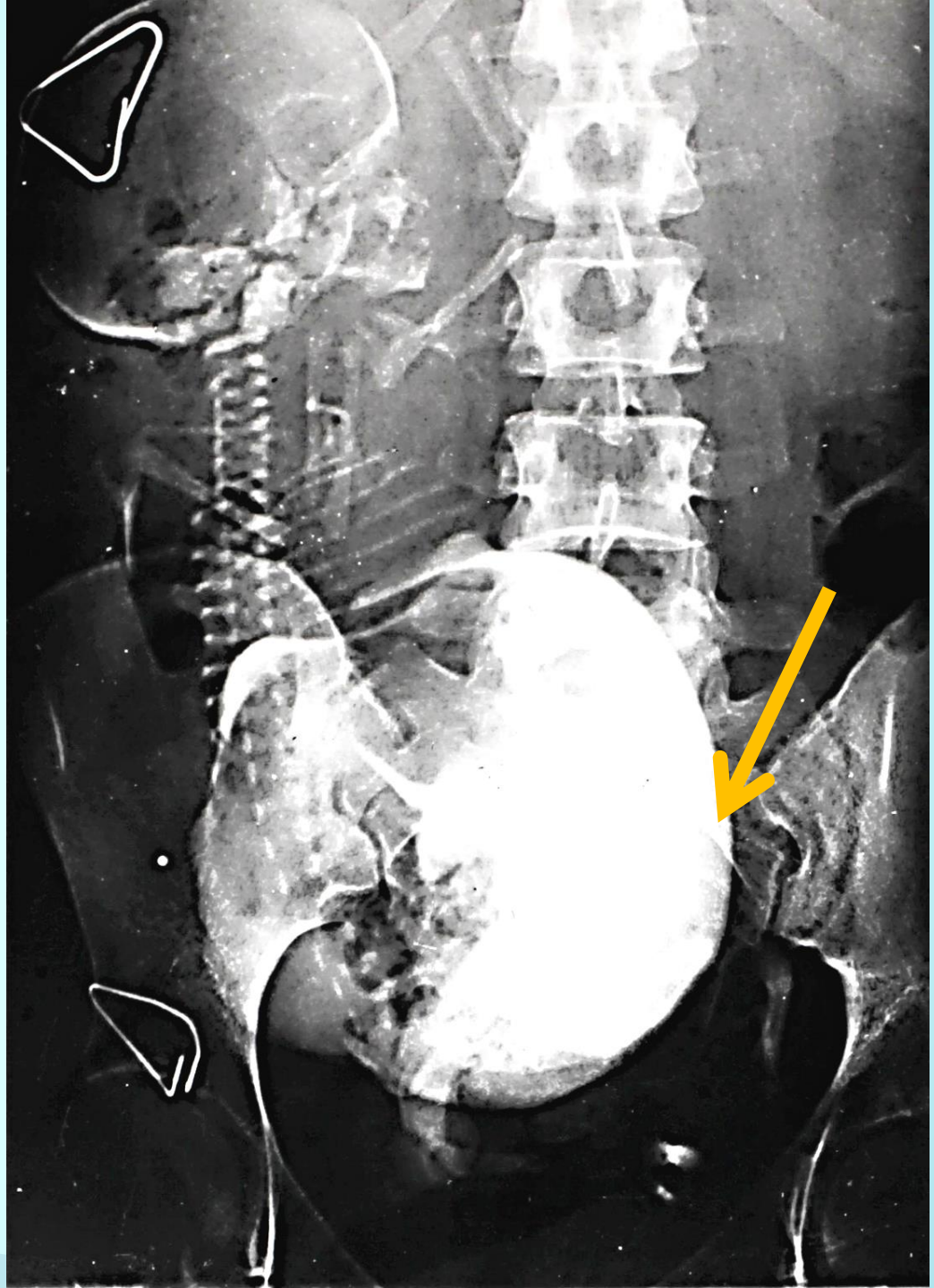
# Attempted amniogram 9/6/1963

Fetal hydrops with ascites

Needle tip in fetal peritoneum

Large liver

Convex undersurface of diaphragm



‘Later he states ‘a fortuitous visitor passed through Auckland. This was a young English lady, aged 22, a geneticist who had been working in Nigeria on her favourite topic of sickle cell disease. With her she had some beautiful blood slides from neonates. . . who had been given normal (red) cells intra-peritoneally. There were floods of normal (red) cells in their peripheral blood

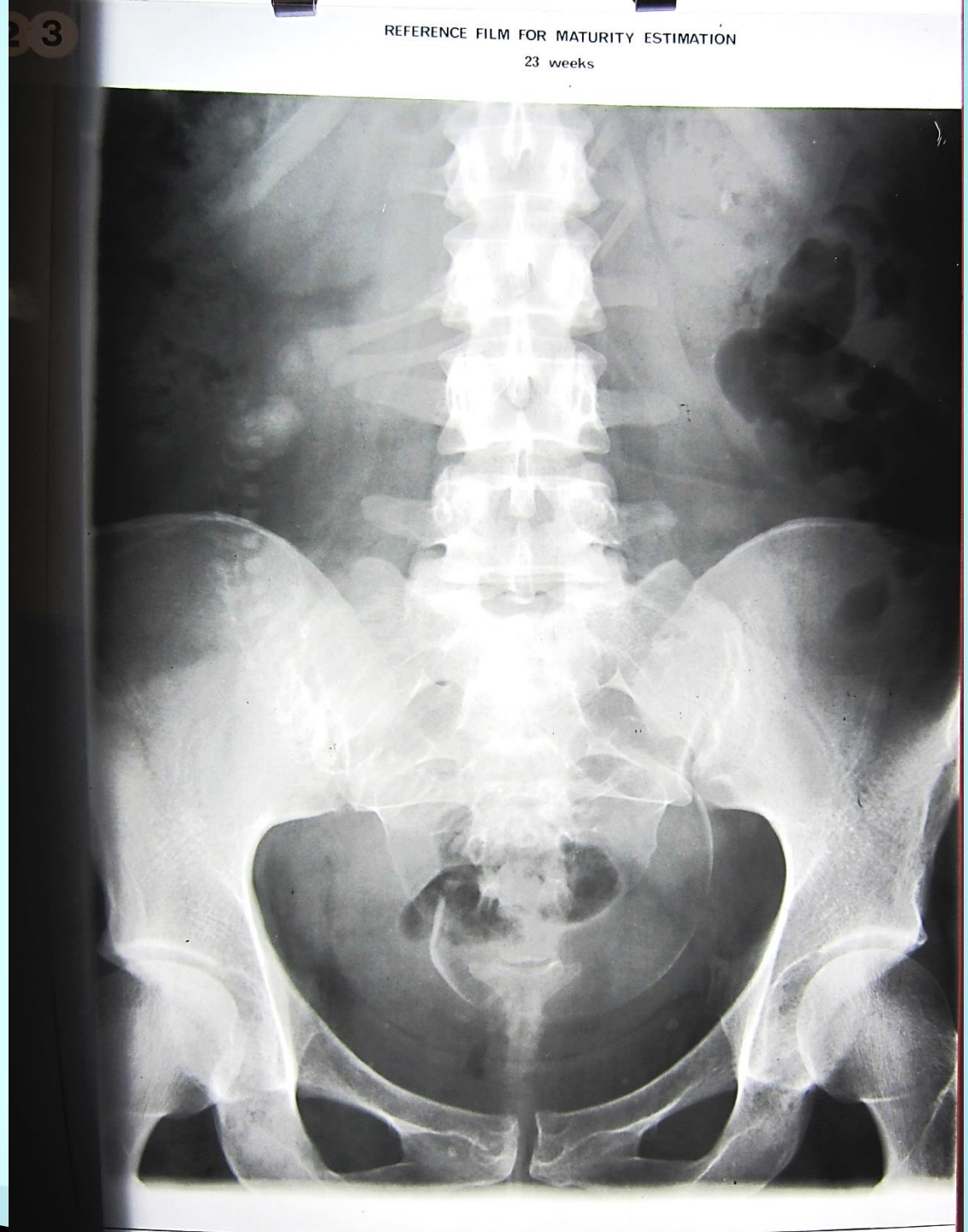
**and this was good enough evidence for us that cells could be taken up from the peritoneum in massive quantity and at a relatively rapid rate. *So* why not do this deliberately and transfuse Rh negative red cells into the fetal peritoneal cavity thus raising the infant’s haemoglobin and hopefully prolong its intra-uterine life.’**

Tovey, Transfusion Medicine 1992

# How were the transfusions done?

# Radiography

- Plain film maternal abdomen



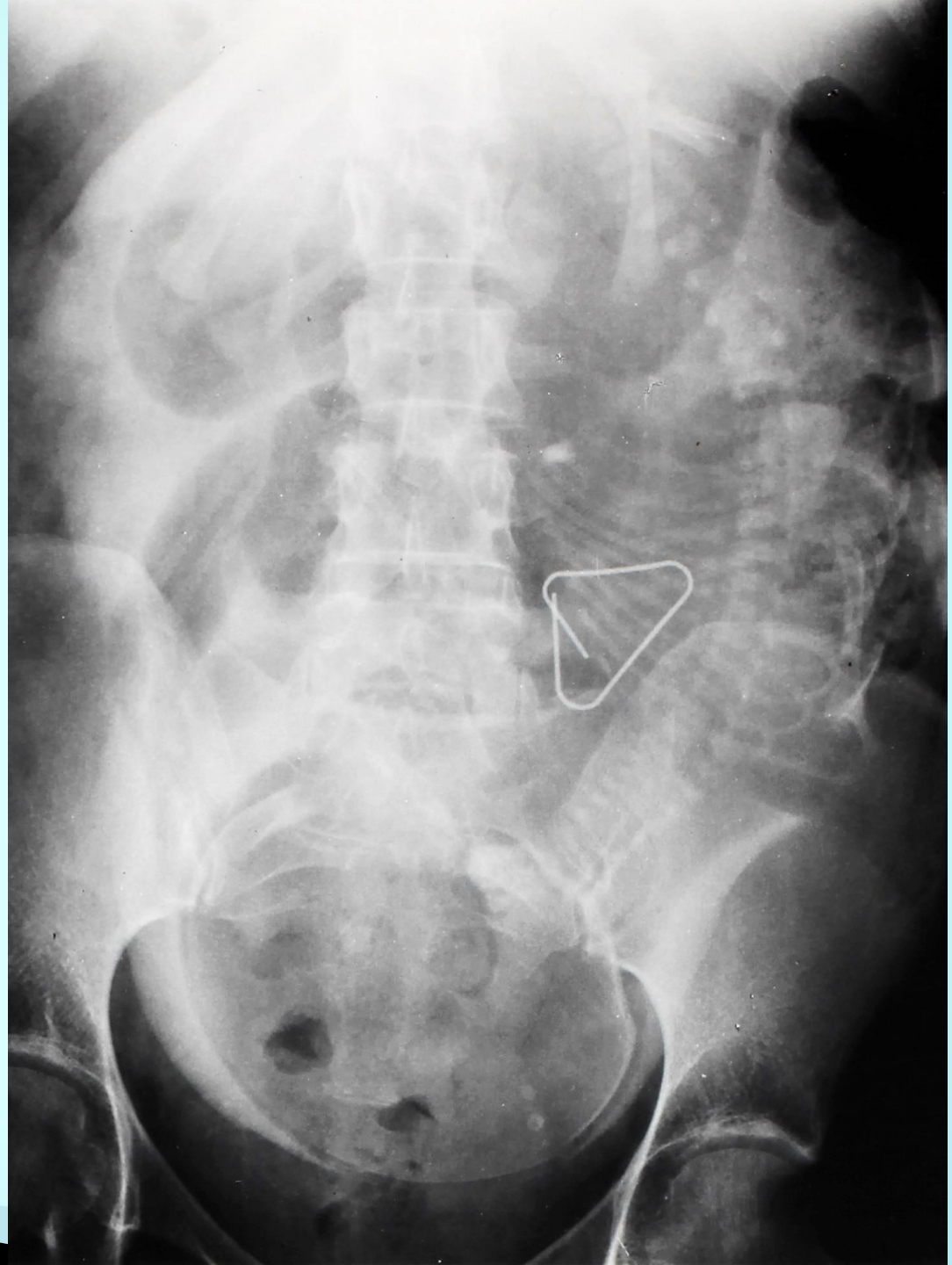
# Day One

Amniogram (labelled normal)

Liquor opacified

Marker over fetal chest

Dated 6/2/64

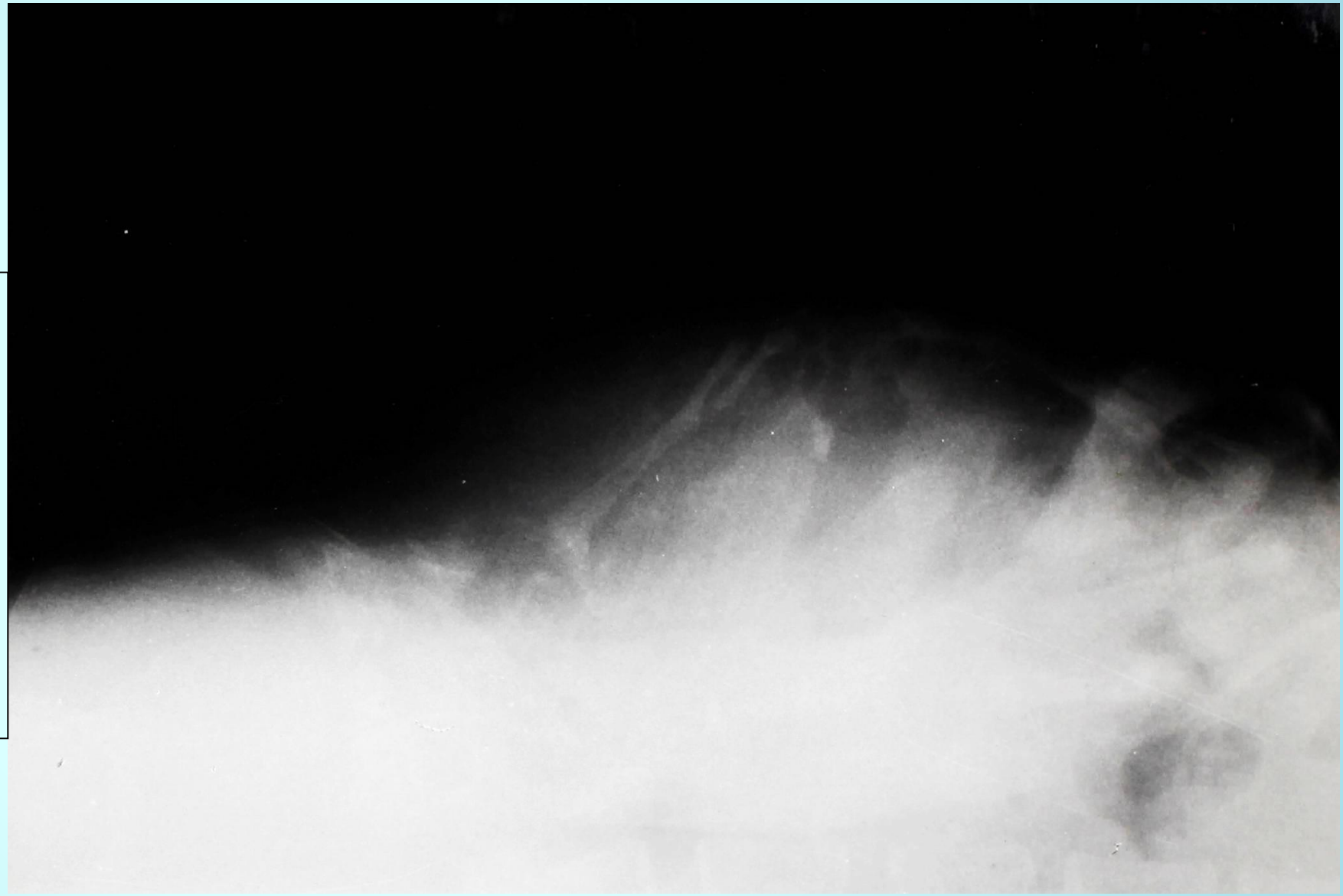


# Day 2

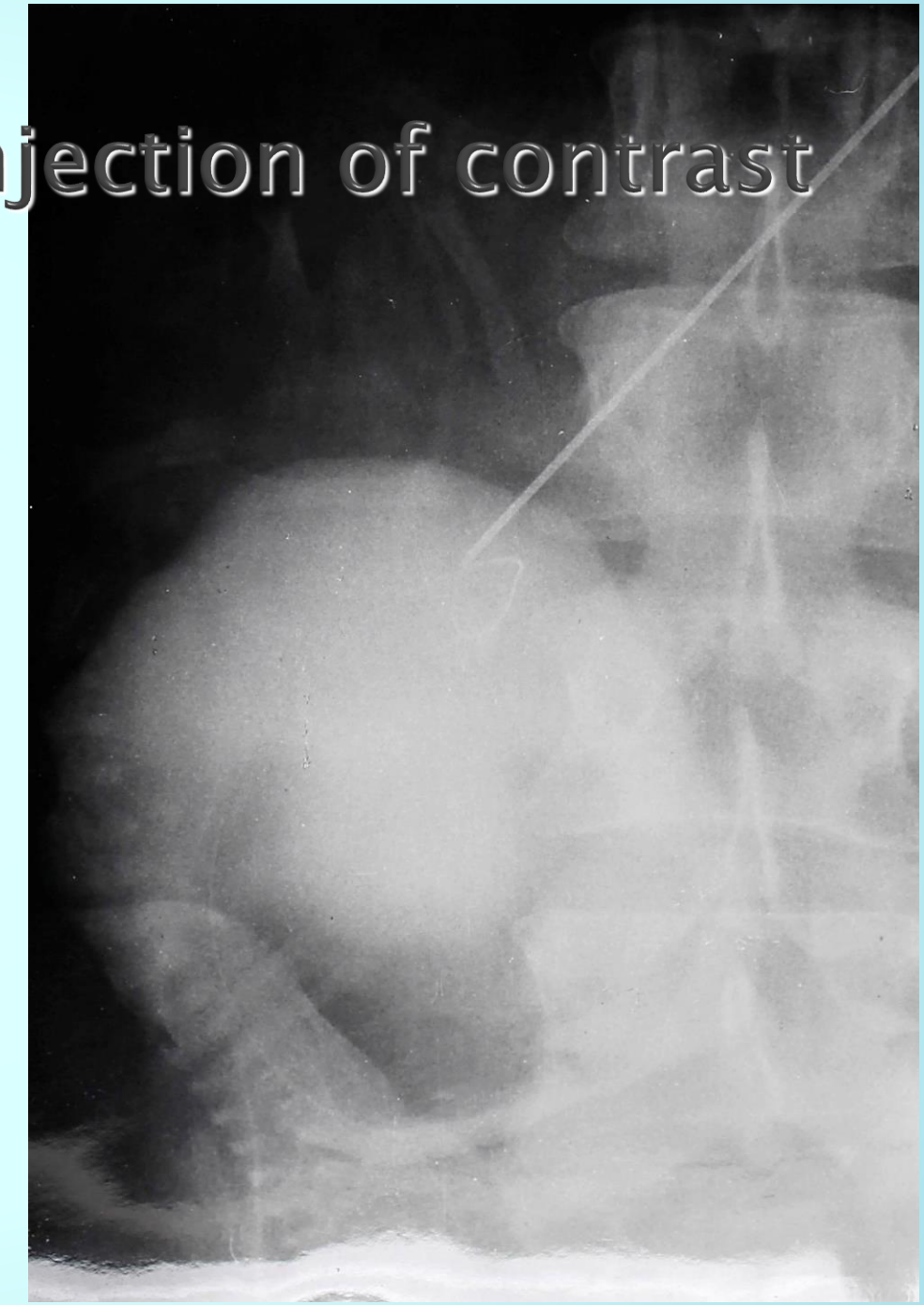
Normal aminogram

Lateral view maternal abdomen

Placenta anterior



# Successful intraperitoneal injection of contrast



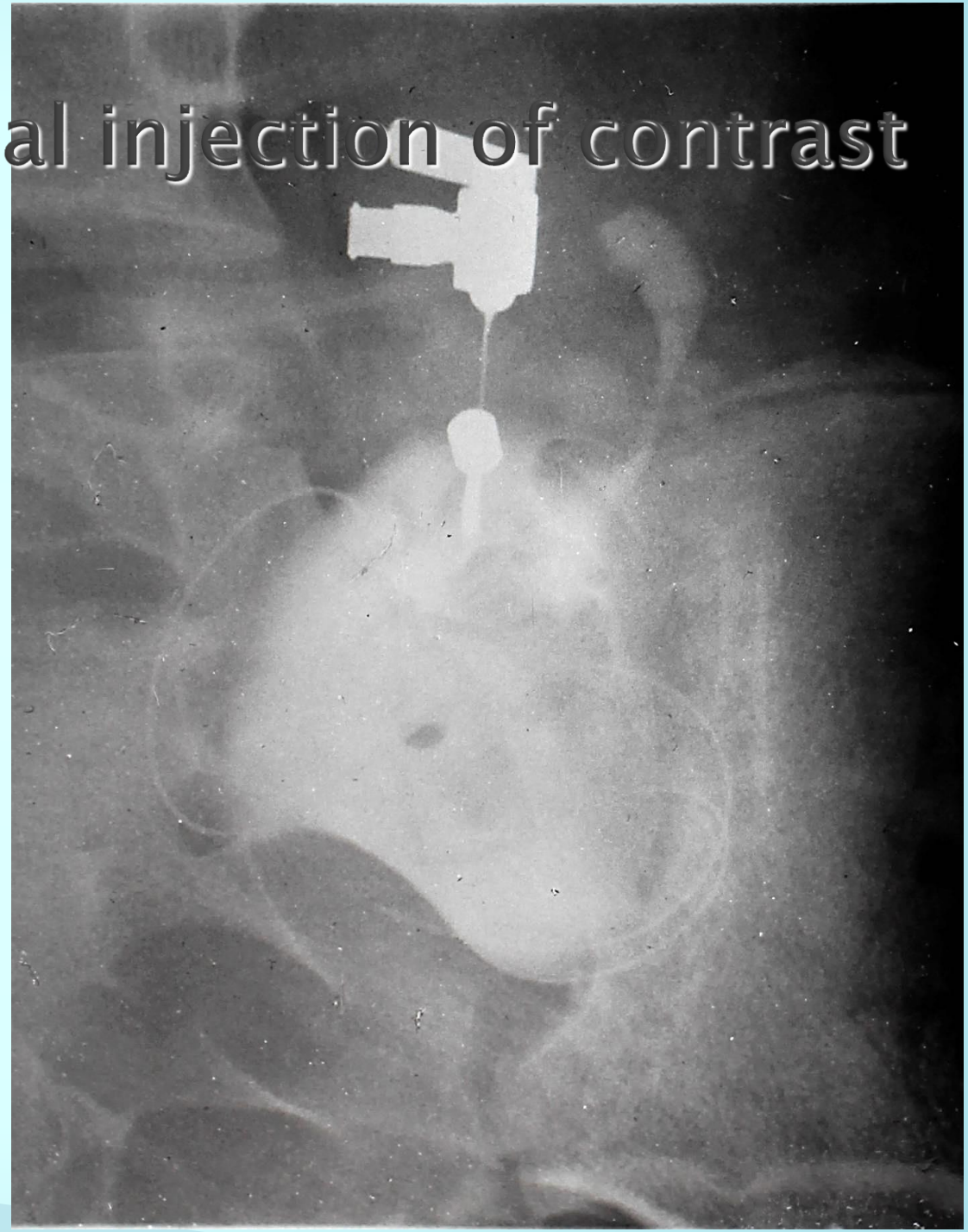
Needle inserted and contrast injected

# Successful intraperitoneal injection of contrast

Catheter in place

ECG wire inserted

$CO_2$ instilled

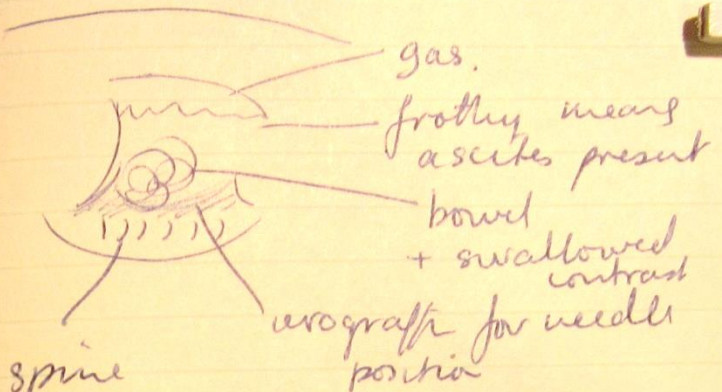


4. Operator puts markers on skin of maternal abdomen for puncture site

5. Screen 1st — manual coning
- adjust kV 75-90 (~85)
use phantom between legs to get correct.
also adjust TV contrast + brightness knobs — max. contrast.
find spine - femora - bowel+contrast + check puncture site.

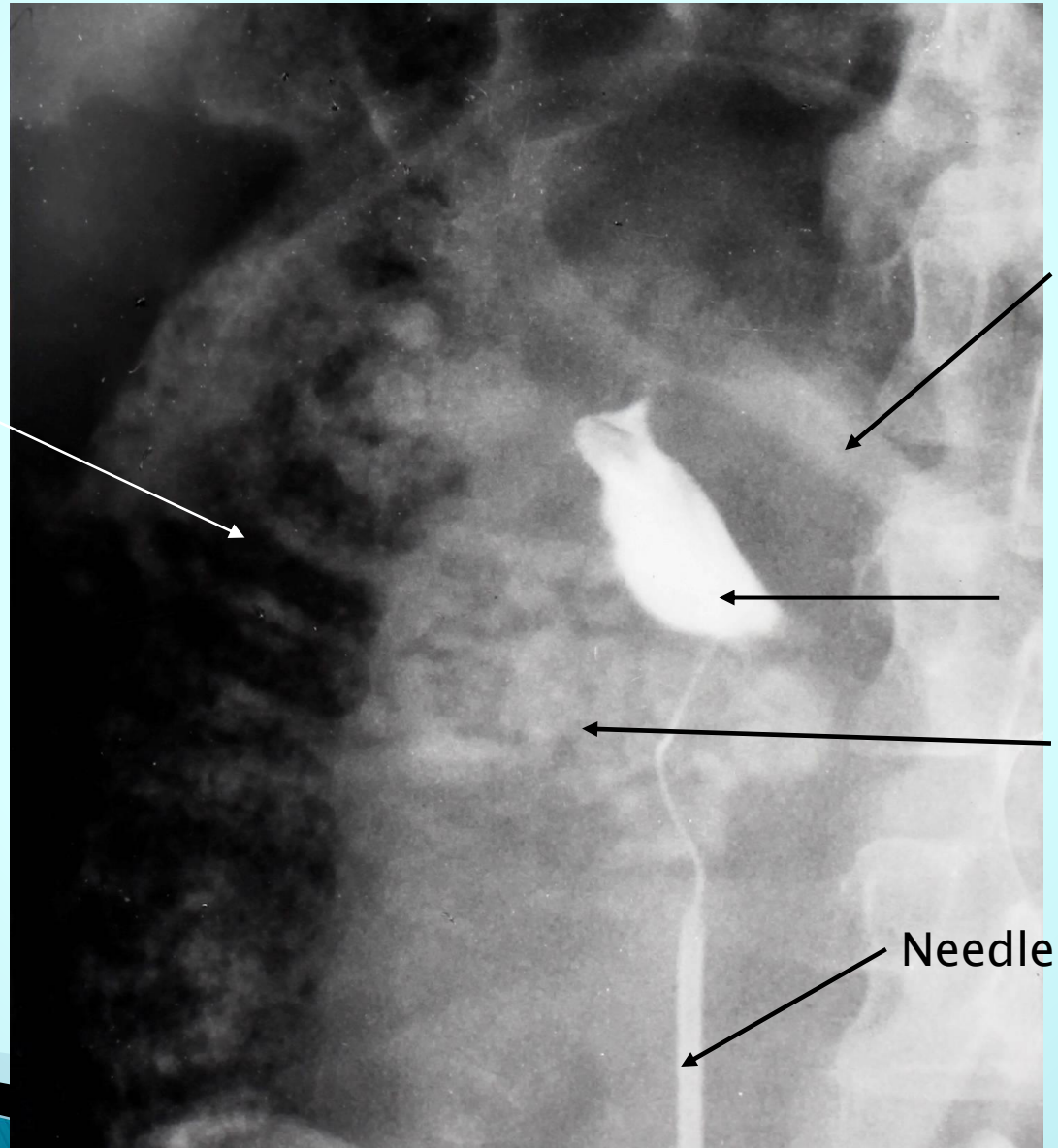

6. Operator punctures
- insert urograffin down needle - check this contrast disposes freely in peritoneum - curved shadows. — screen 2nd.

7. Catheter replaces needle - $CO_2$ introduced into catheter to check catheter position.
Use lateral coned film similar to the first film. Film 2




(8) All correct — transfuse blood.

# Fetal abdomen with opacified fetal bladder and bowel



Dr Tony Crick
1st Radiologist at Cornwall
National Women's

Possibly was radiologist for
1st fetal transfusions

(family of Crick of Watson, Crick Wilkins and Franklin fame)

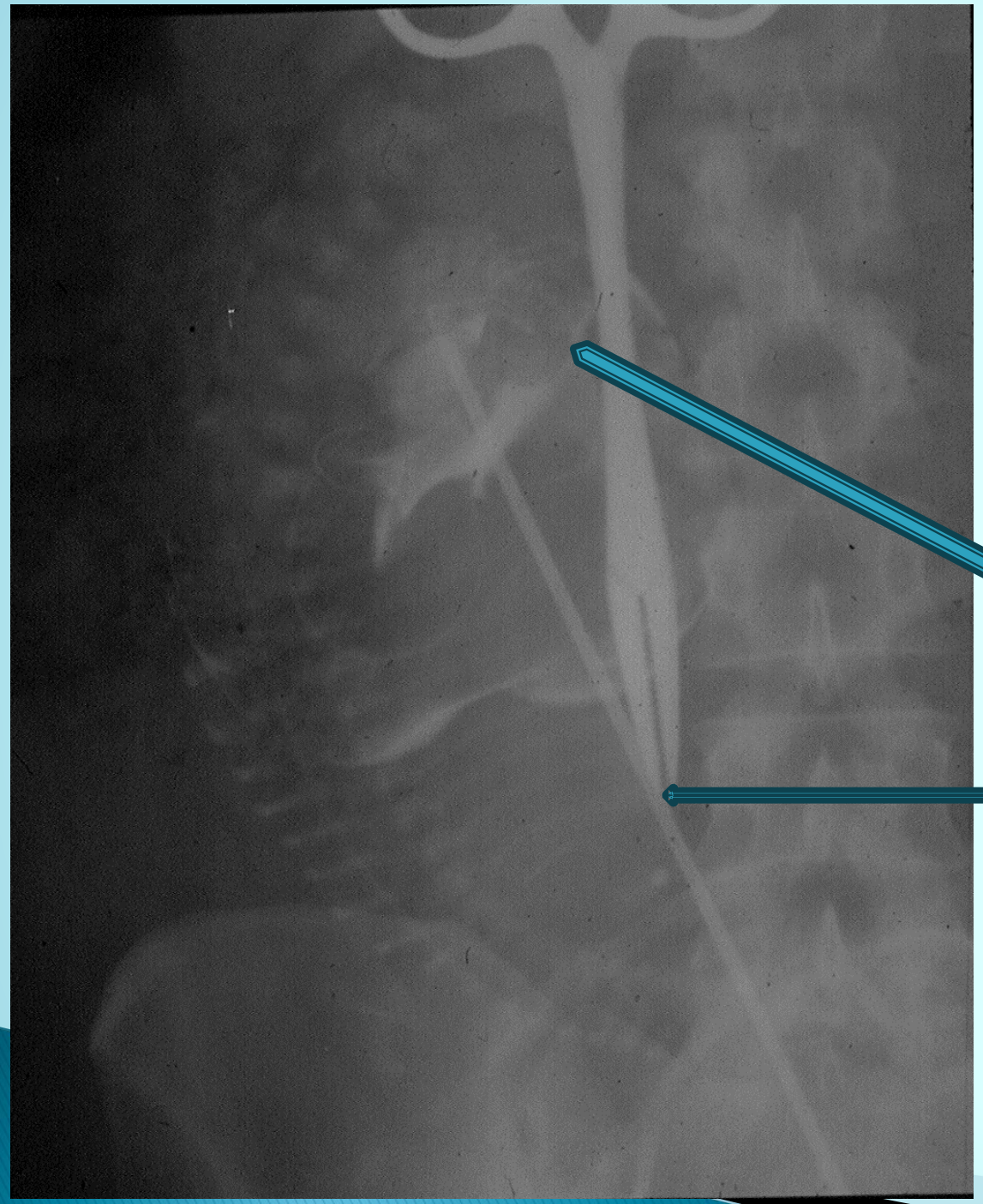


Image from 1st successful transfusion

Contrast medium and coiled catheter in the fetal peritoneal cavity

The Tuohy needle has been withdrawn and lies on the maternal abdominal skin

BrMedJ. 1963;II: 1107–1109

# Preliminary Communications

## Intrauterine Transfusion of Foetus in Haemolytic Disease

A. W. Liley, Ph.D., M.B., B.Med.Sc., Dip.Obst.,
Senior Research Fellow.
National Women's Hospital,
Auckland, New Zealand.

Report of the 4th transfusion and 1st survivor, Grant Liley McLeod


# The New Zealand Herald

AUCKLAND, TUESDAY, SEPTEMBER 24, 1963 • Price 3d—Special Freight 4d




## Seek Interpol Aid

## g Hunt

## MUGGLING

## Grown In uckland

Wellington number of recent Court ces in Auckland and ce have asked Interpol ice for any information ggling in the Pacific. fficers have been asked to rts throughout the country. ng.

ve that a ing taken om India inquiries rmine the

## HOLMBANK WRECKAGE WASHED UP

Warning Given To Searchers

Baby McLeod in his incubator at the National Women's Hospital yesterday. Right: His mother, Mrs McLeod.

## New Cook Strait Road-Rail Ferry Approved

## PRE-BIRTH TRANSFUSION SAVES BABY BOY

Auckland doctors have successfully given blood transfusions to a baby before birth.

This is believed to be the first time this has ever been done and is a significant step in saving the lives of some babies having an Rh blood group incompatible with that of the mother.

The baby, a boy, was delivered to Mrs E. McLeod, of Fernhill, Hastings at National Women's Hospital, Green Lane, on Friday evening. Without the transfusions it is certain that he would not have been born alive.

Professor G. H. Green, associate-professor of the post-graduate school of obstetrics and gynaecology, said yesterday that the developments at National Women's Hospital had begun with a pure research project seven years ago by Dr S. W. Liley, senior medical research fellow at the school.

**More Accuracy**

His work was intended to give a more accurate idea of how severely the baby was being affected by the presence of antibodies in the mother's blood by using a system first described a year or two previously by some workers in Manchester, England.

This involved analysis of a specimen of the fluid surrounding the baby taken by a needle puncture under local

were born occurred about March this year and came from a casual observation made to Dr Liley by a visiting doctor from Africa," he said.

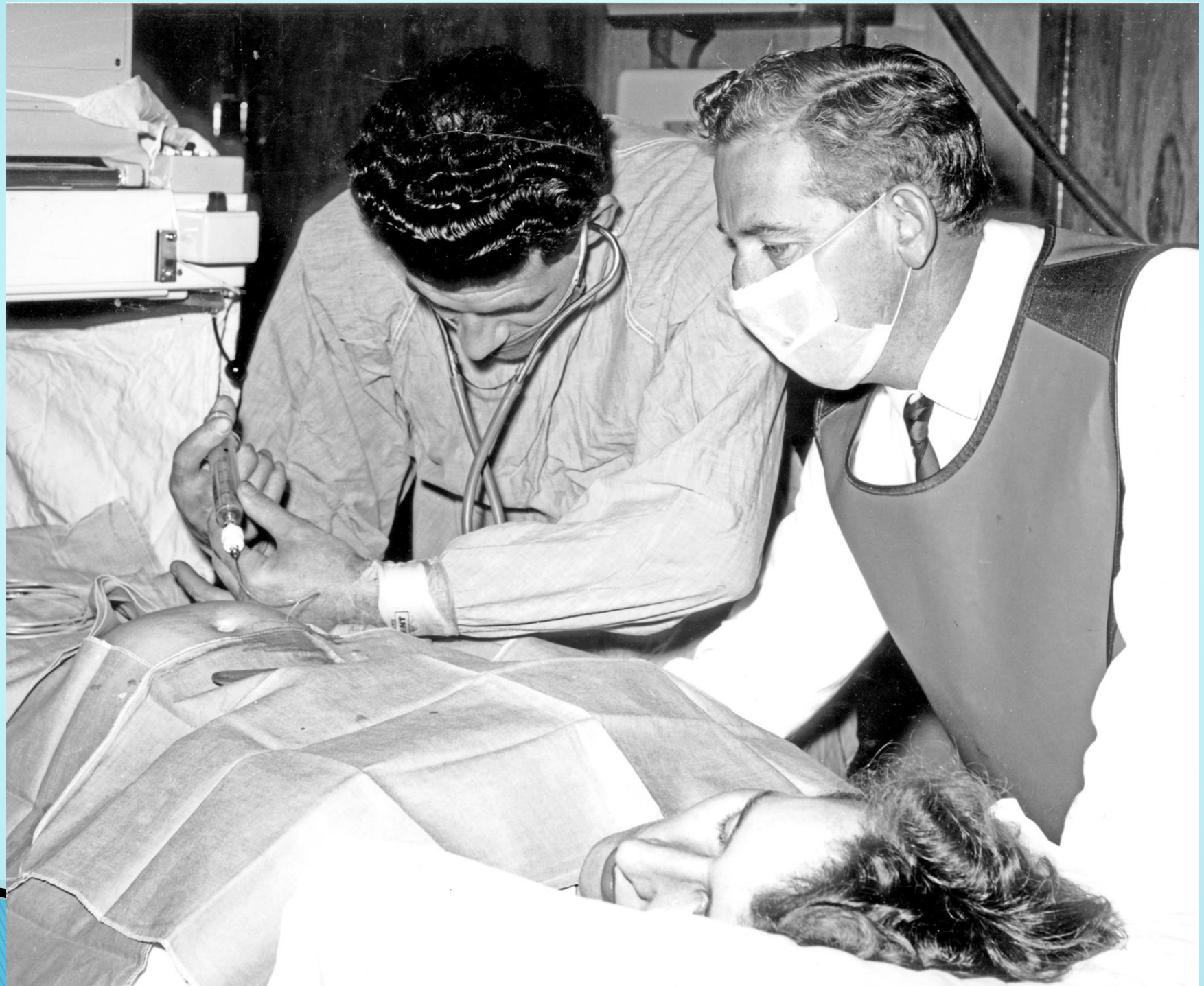
But the problem was to get the blood into the baby's abdominal cavity.

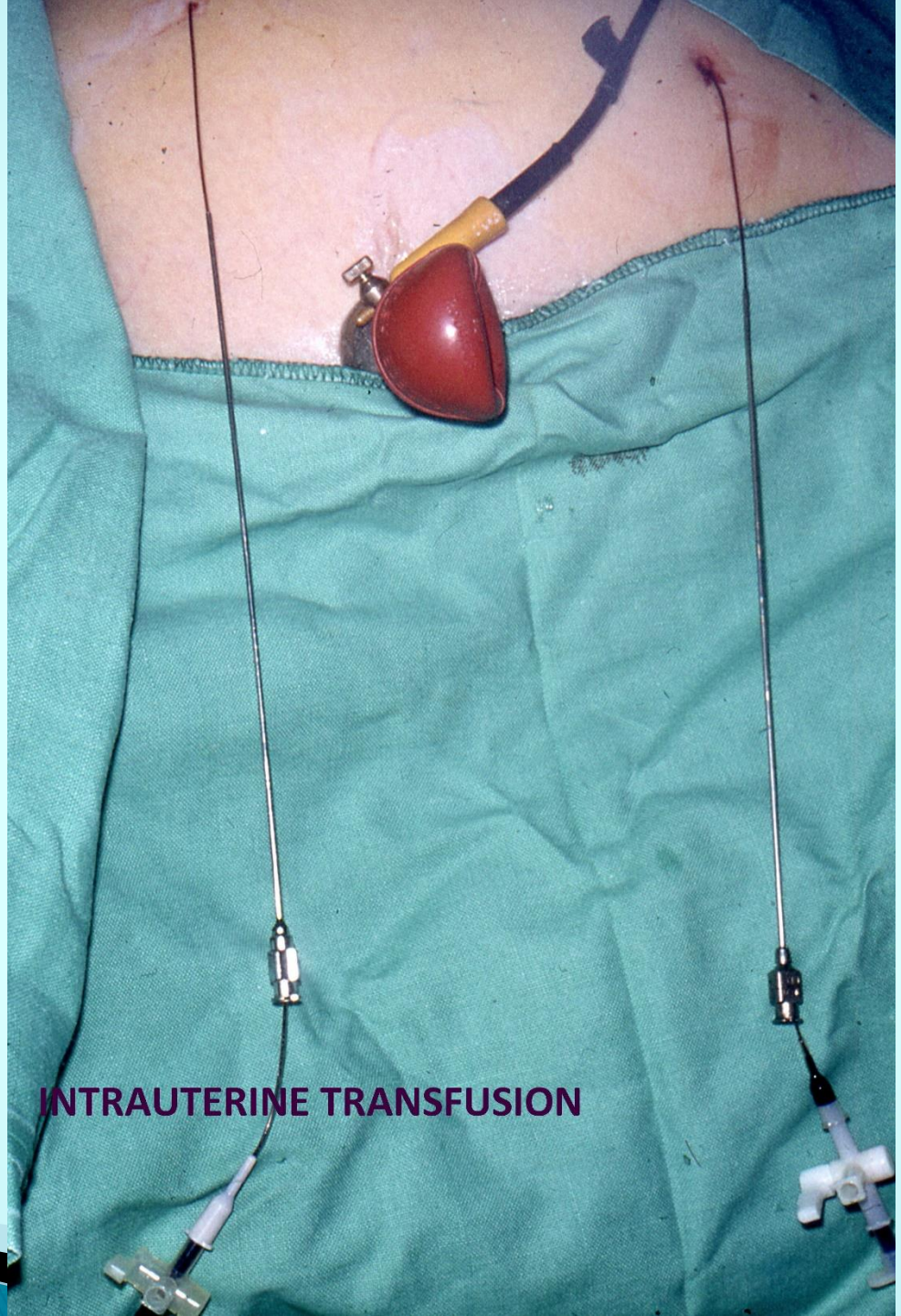
**Dye Injected**

Doctors injected a non-harmful dye, which showed up in the x-rays, into the fluid around the baby. The infant swallowed some of the fluid which later showed on the x-rays the position of the bowel and was a guide to the position of the abdominal cavity.

A fine hollow needle was introduced into the infant's abdominal wall. Through this was passed a fine polythene tube and the needle was withdrawn.

Through the tube was introduced 100 cubic centimetres of red blood cells of a group known to be compatible with that of the baby but unable to be affected by the mother's antibodies





INTRAUTERINE TRANSFUSION

**Table 8**

*Maternal Complications Associated With Intrauterine Fetal Transfusions*

| | |
|---|---|
| *Infection* | 6 |
| Clostridia (2) | |
| Septic Shock (1) | |
| Amnionitis (1) | |
| Staphylococcal (1) | |
| Endometritis (1) | |
| *Bleeding* | 3 |
| Undiagnosed & Ruptured Uterus (1) | |
| Vaginal Hemorrhage (1) | |
| Fetal—Maternal (1) | |
| *Other* | 7 |
| Injection of Maternal Structure | |

Total Number of Mothers = 238 = 9/238 = 3.8% Risk
Total Number of I.U.T.'s = 399 = 9/399 = 2.5% Risk

Ross Conference
On Pediatric Research
1966
Lucey JF

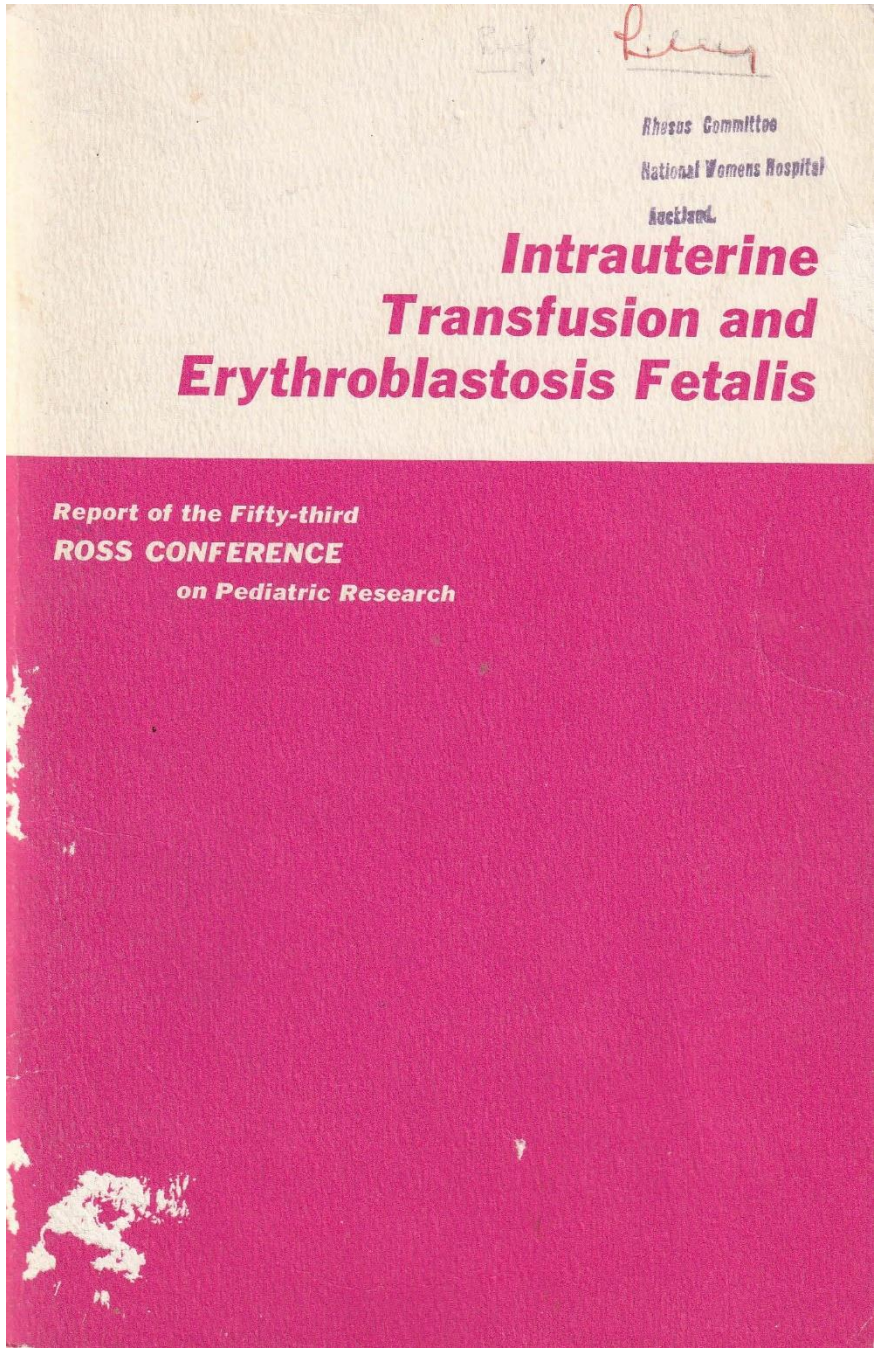
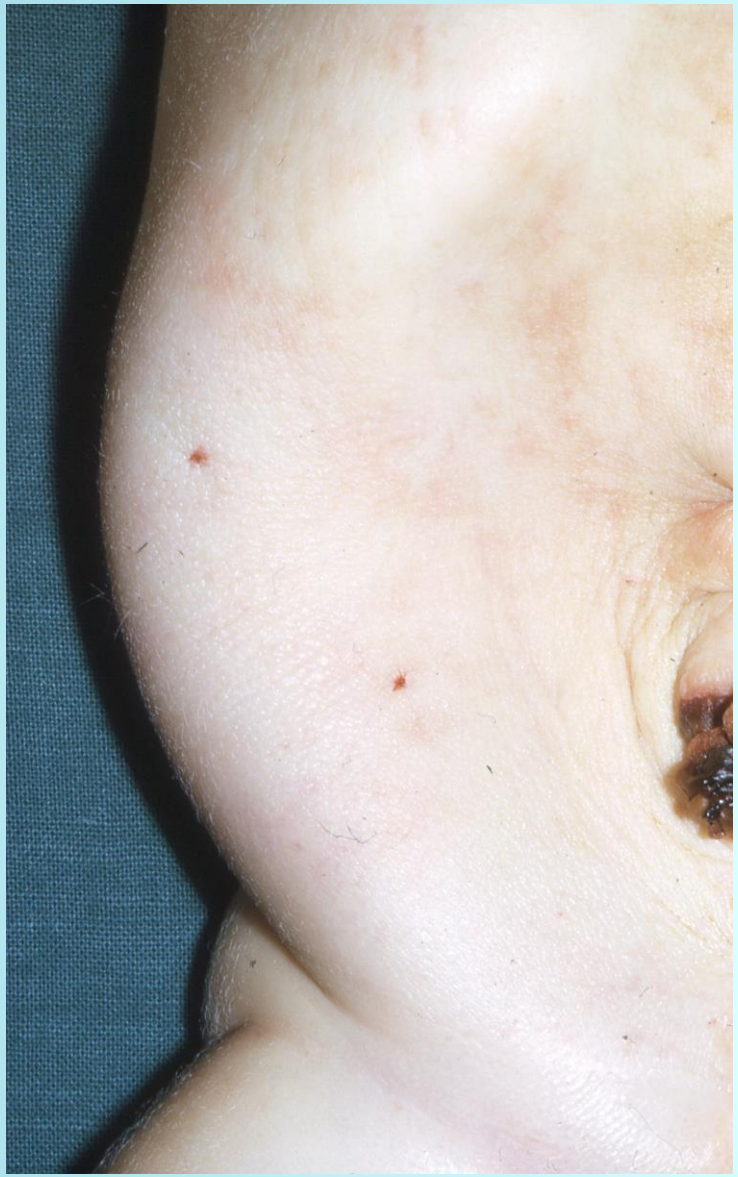


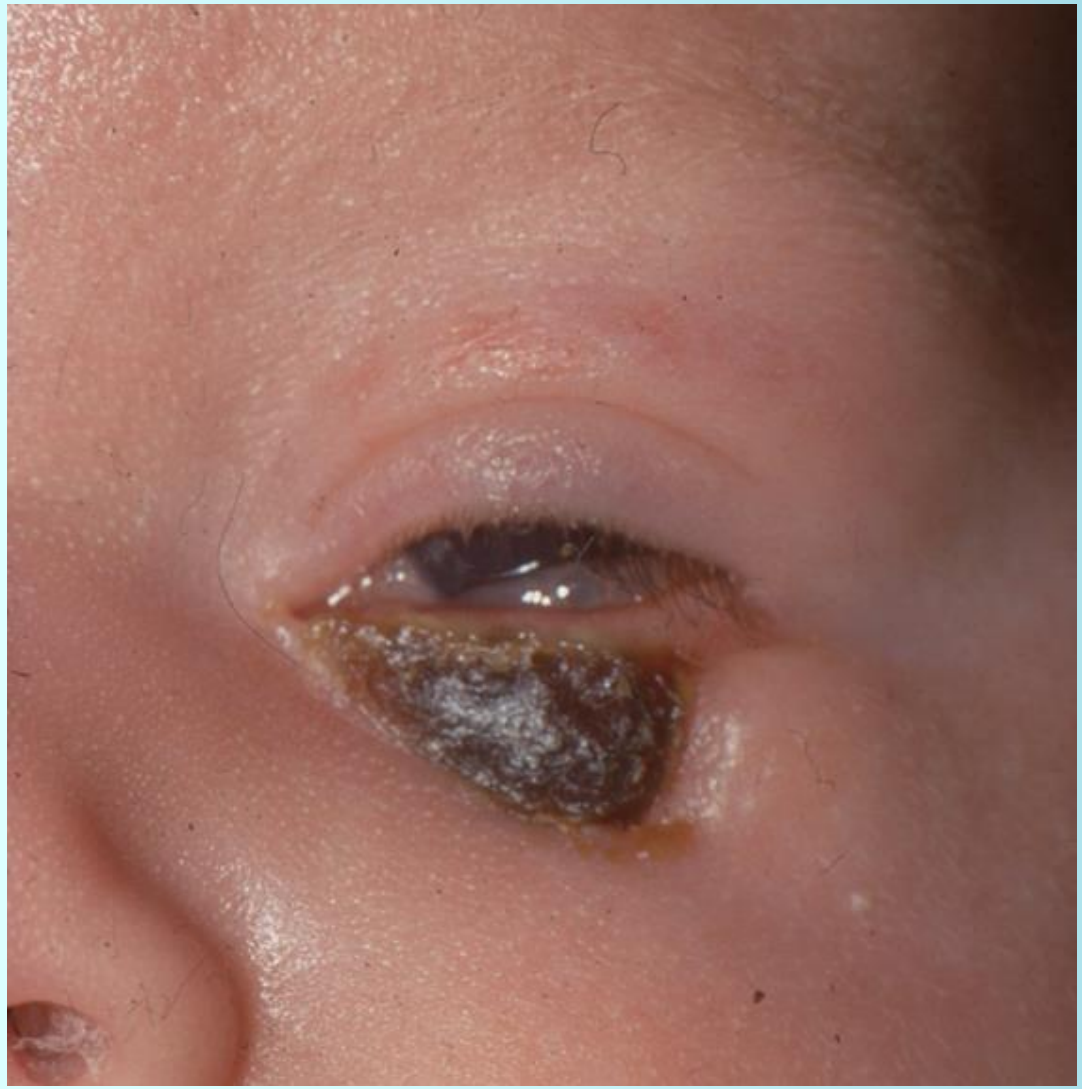

**Table 13**

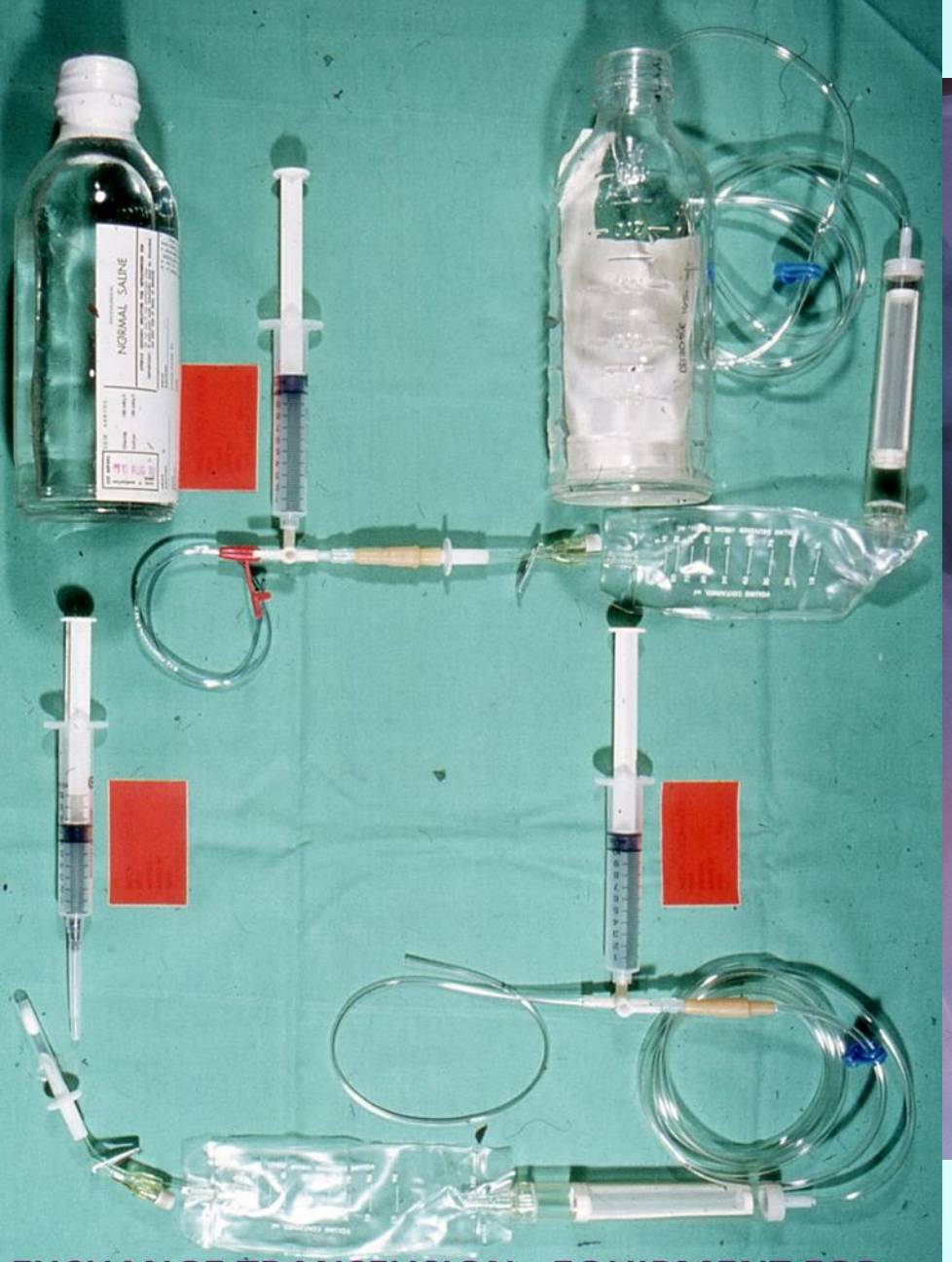
*Intraperitoneal Infusions Following Hysterotomy*

| Source | Freda, Adamsons and Plentl | Adamsons, Margulies | Margulies |
|---|---|---|---|
| Number of Cases | 13 | 1 | 2 |
| Fetal Age | 18 to 24 weeks | 24 weeks | 24 weeks<br>26 weeks |
| % Hydrops | 75 | 0 | 100<br>100 |
| Time Operation to delivery | Mean 23 days Range two days to two months | Six weeks | Two weeks<br>Three days |
| Outcome | 46% N.N.D.<br>54% SB | L& W after 5 Ex. T. | N.N.D. after Ex. T.<br>N.N.D. at 3 days |

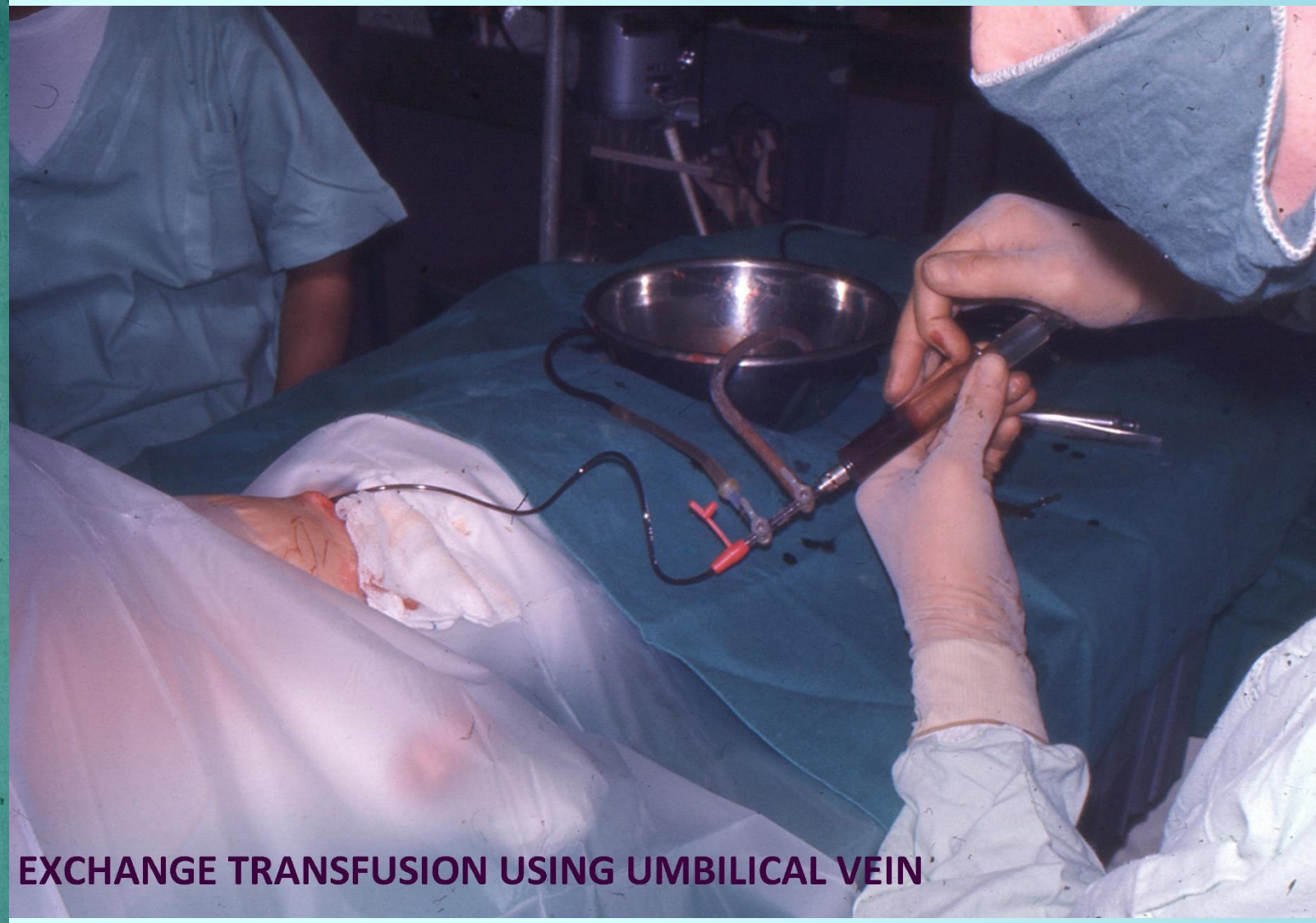
Sr DUNKLEY caring for infant in ambulance



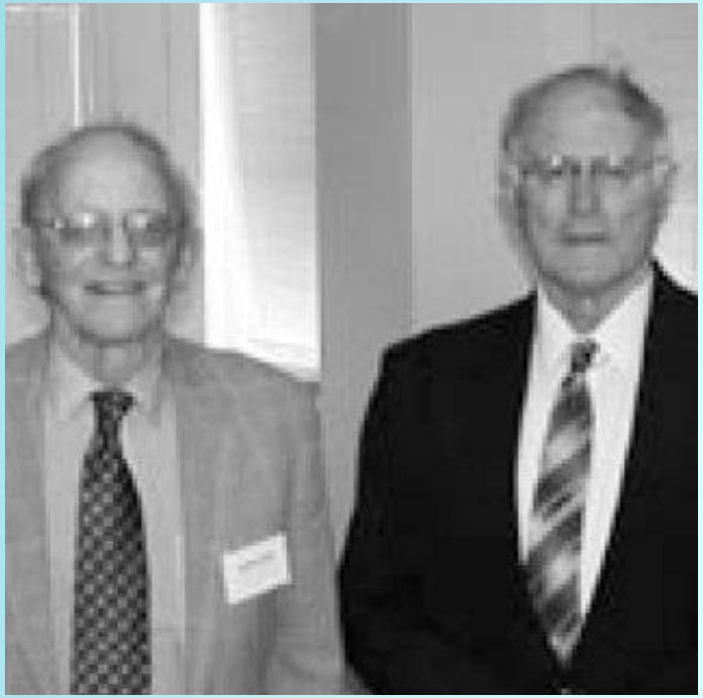





EXCHANGE TRANSFUSION - EQUIPMENT FOR DOUBLE UMBILICAL VESSEL EXCHANGE



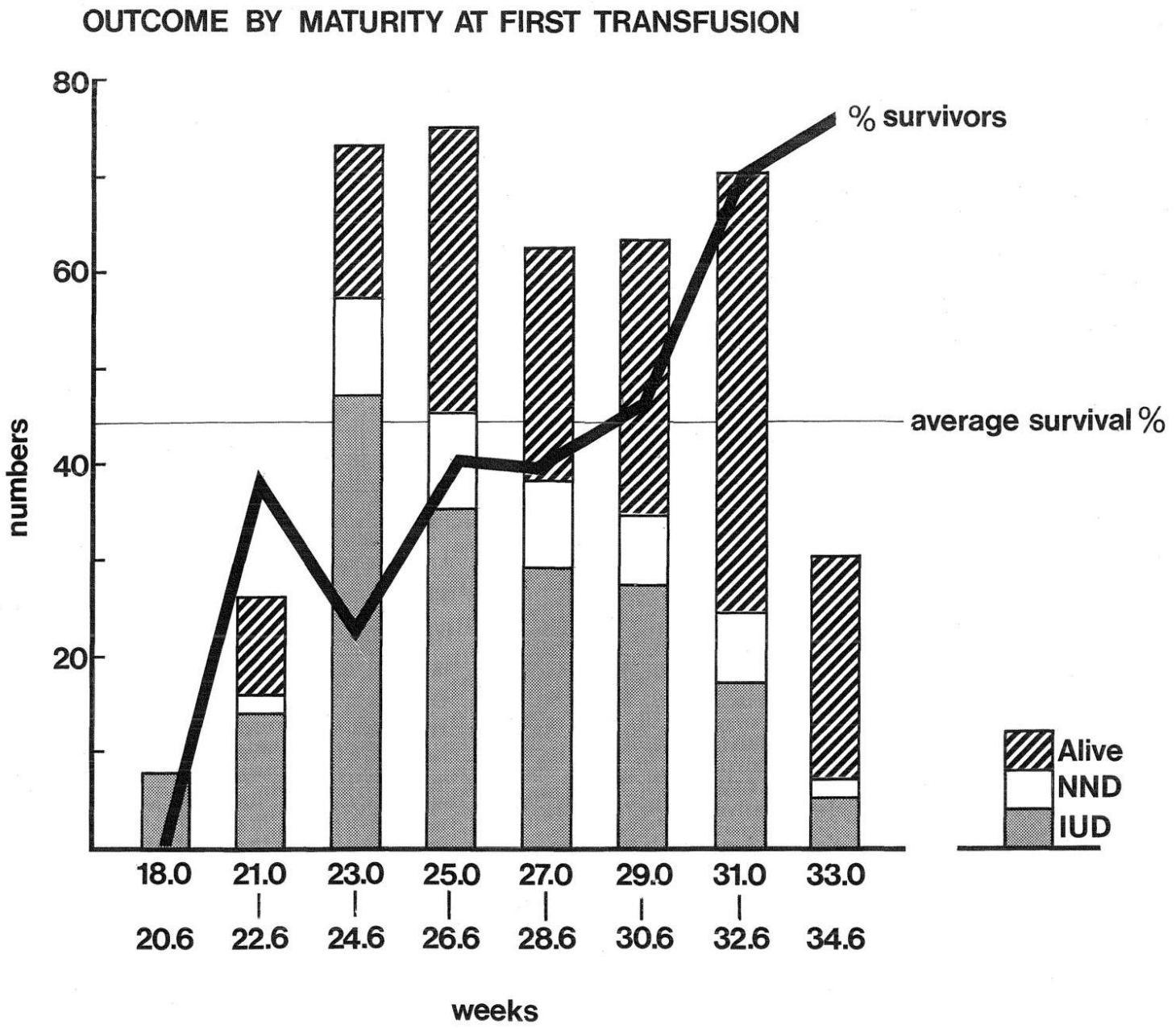
EXCHANGE TRANSFUSION USING UMBILICAL VEIN



Dr Florence Fraser
Laboratory
Blood Bank
Radiology

# The RH Committee was a team affair

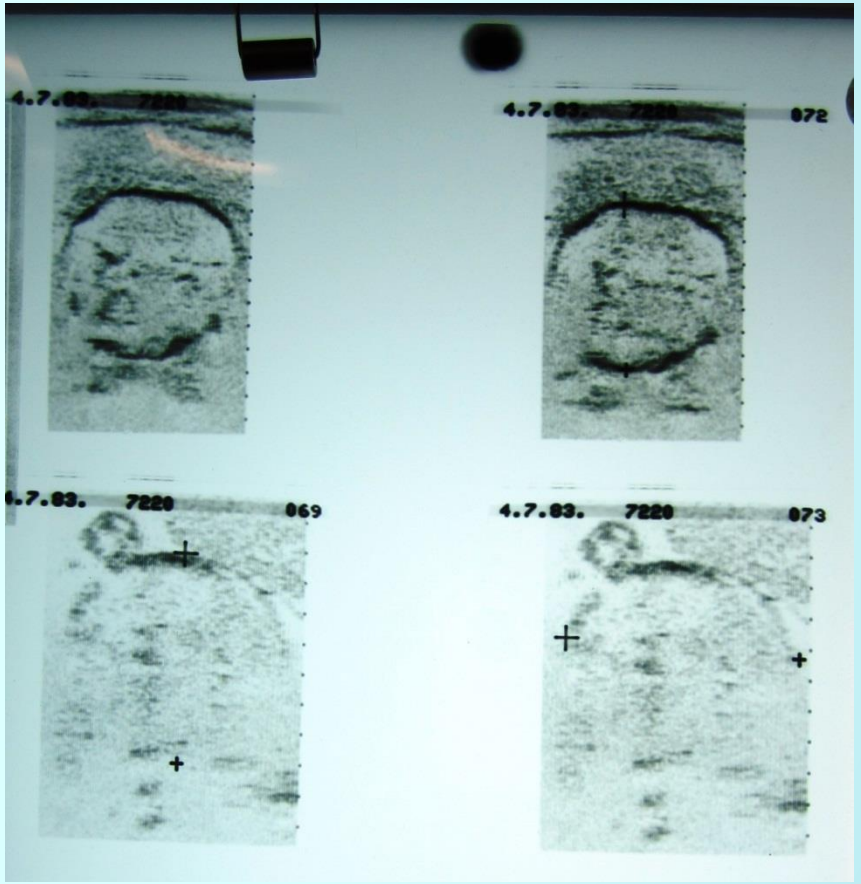
# FETAL TRANSFUSIONS: N.W.H. JUNE 1963-MARCH 1984



# Early real time ultrasound

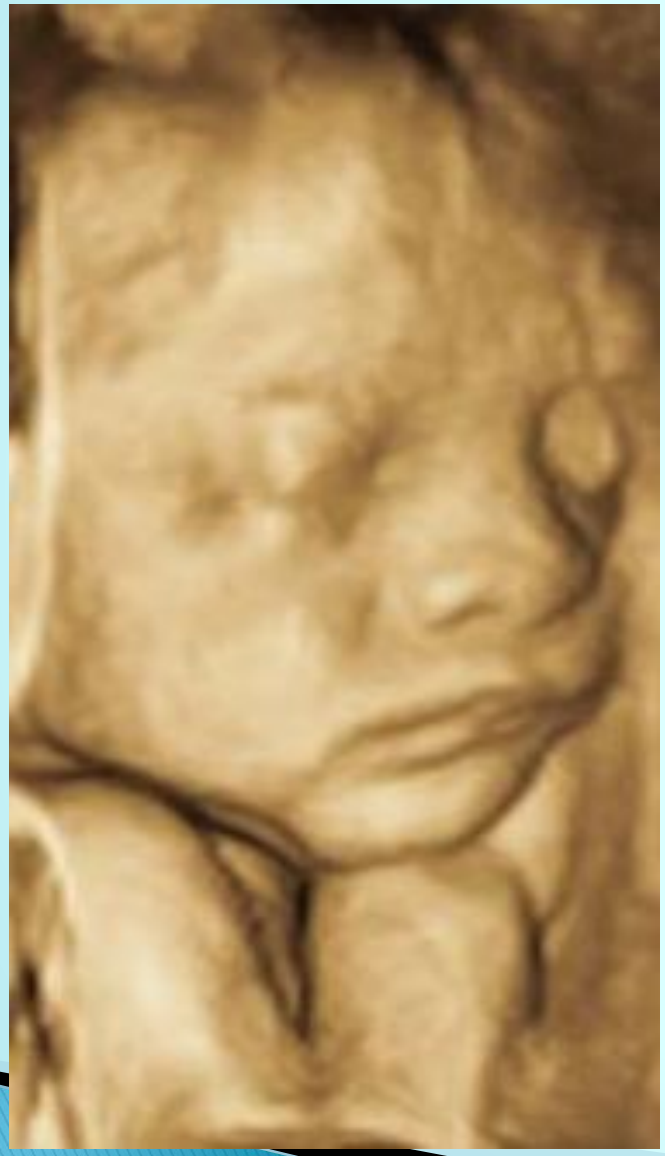
- Early
- Fetal detail still limited

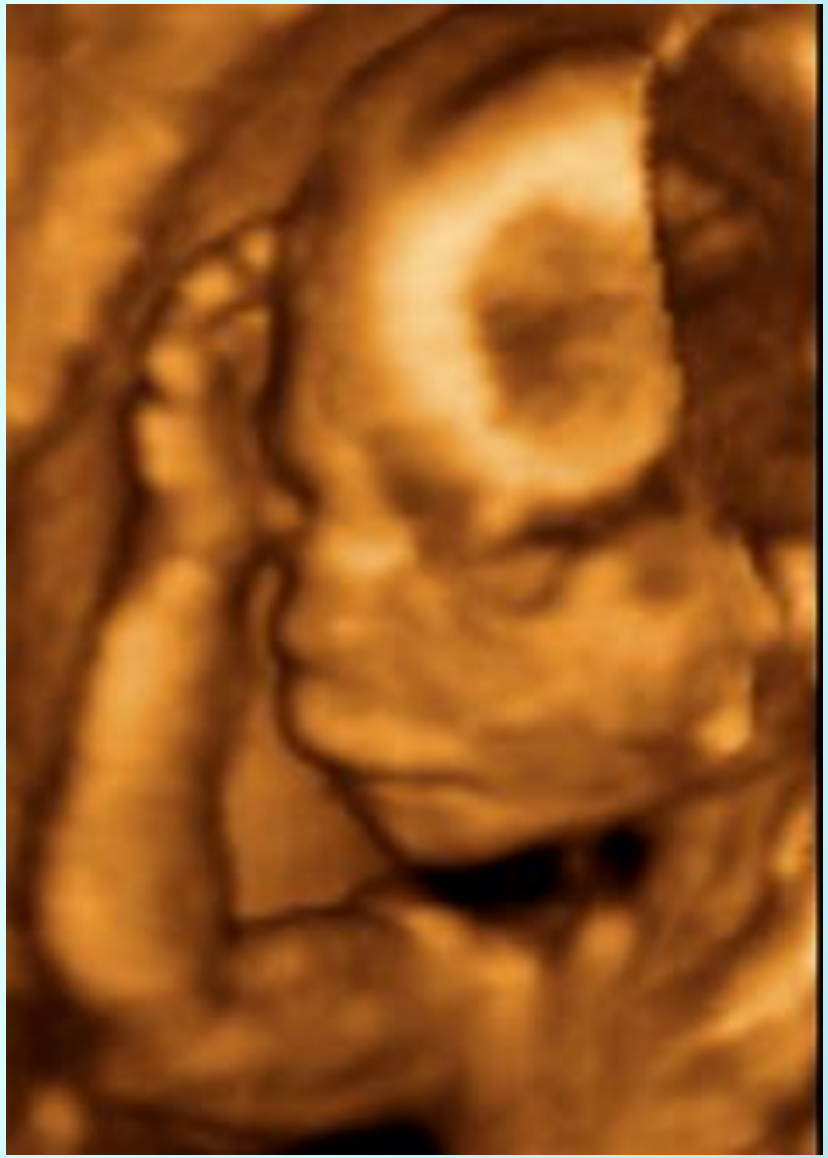
- Showed fetal heart beat and well being
- Whether transfused blood being absorbed
- Ascites improving

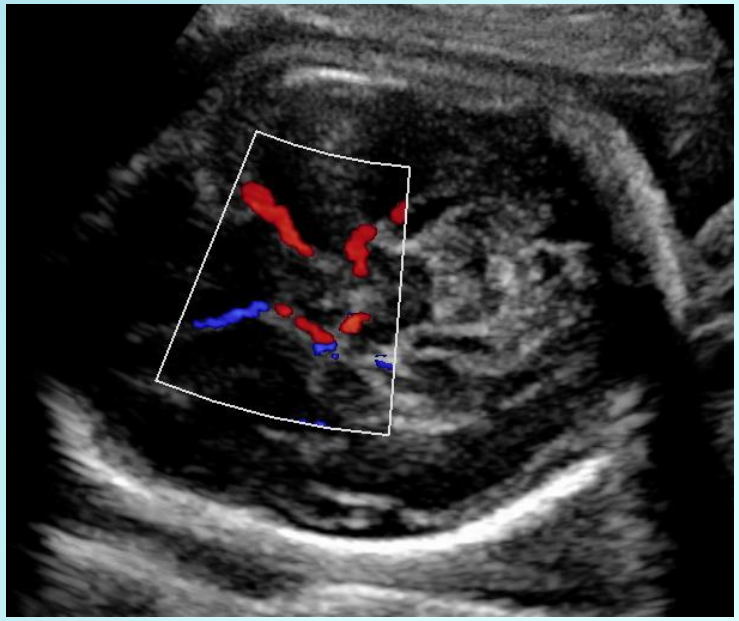


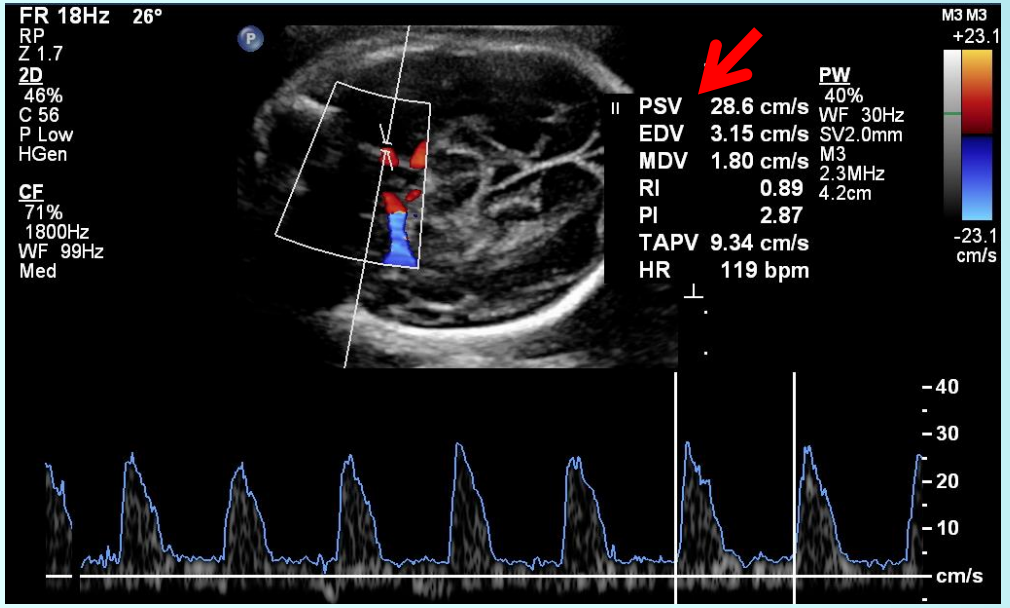

4.7.1983

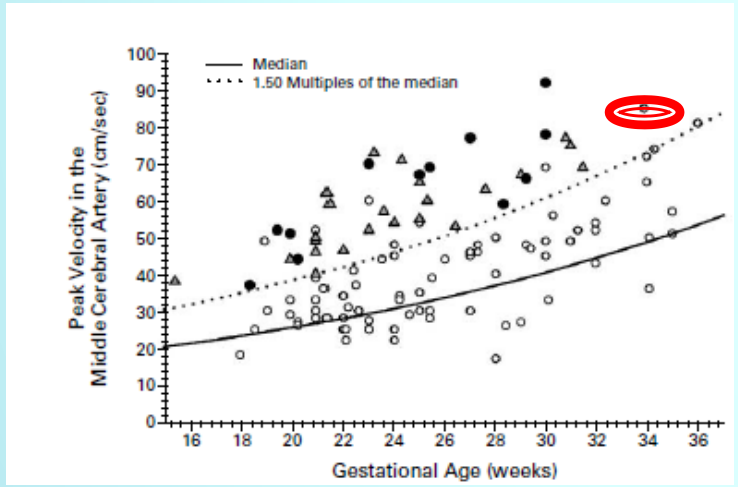
# Ultrasound today

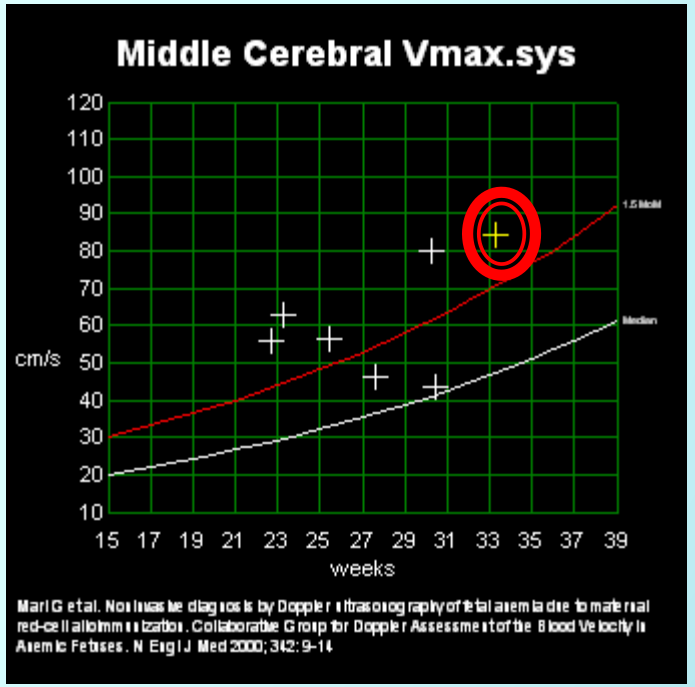






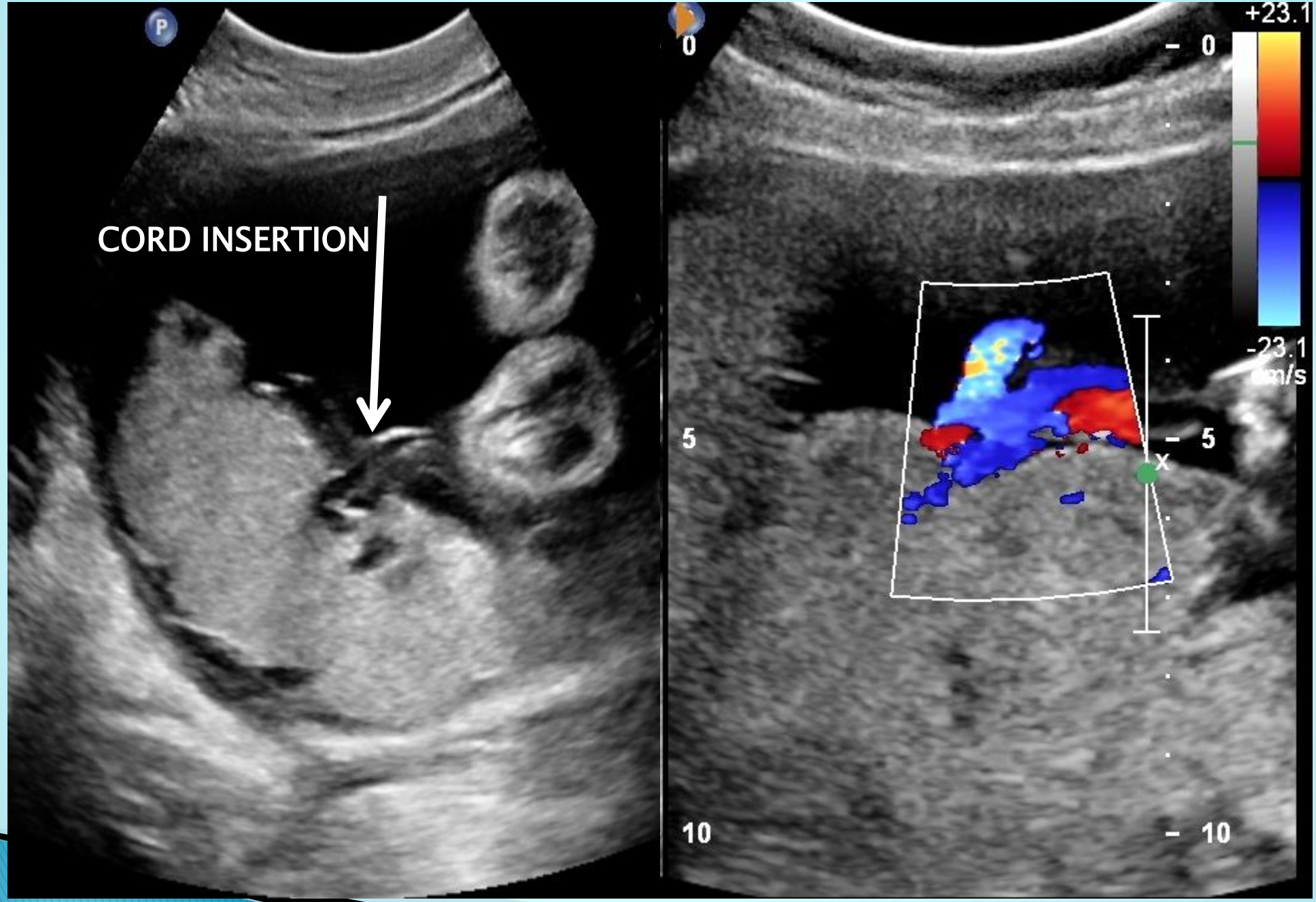



NONINVASIVE DIAGNOSIS BY DOPPLER ULTRASONOGRAPHY OF FETAL ANEMIA DUE TO MATERNAL RED-CELL ALLOIMMUNIZATION

GIANCARLO MARI, M.D., FOR THE COLLABORATIVE GROUP FOR DOPPLER ASSESSMENT OF THE BLOOD VELOCITY IN ANEMIC FETUSES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0
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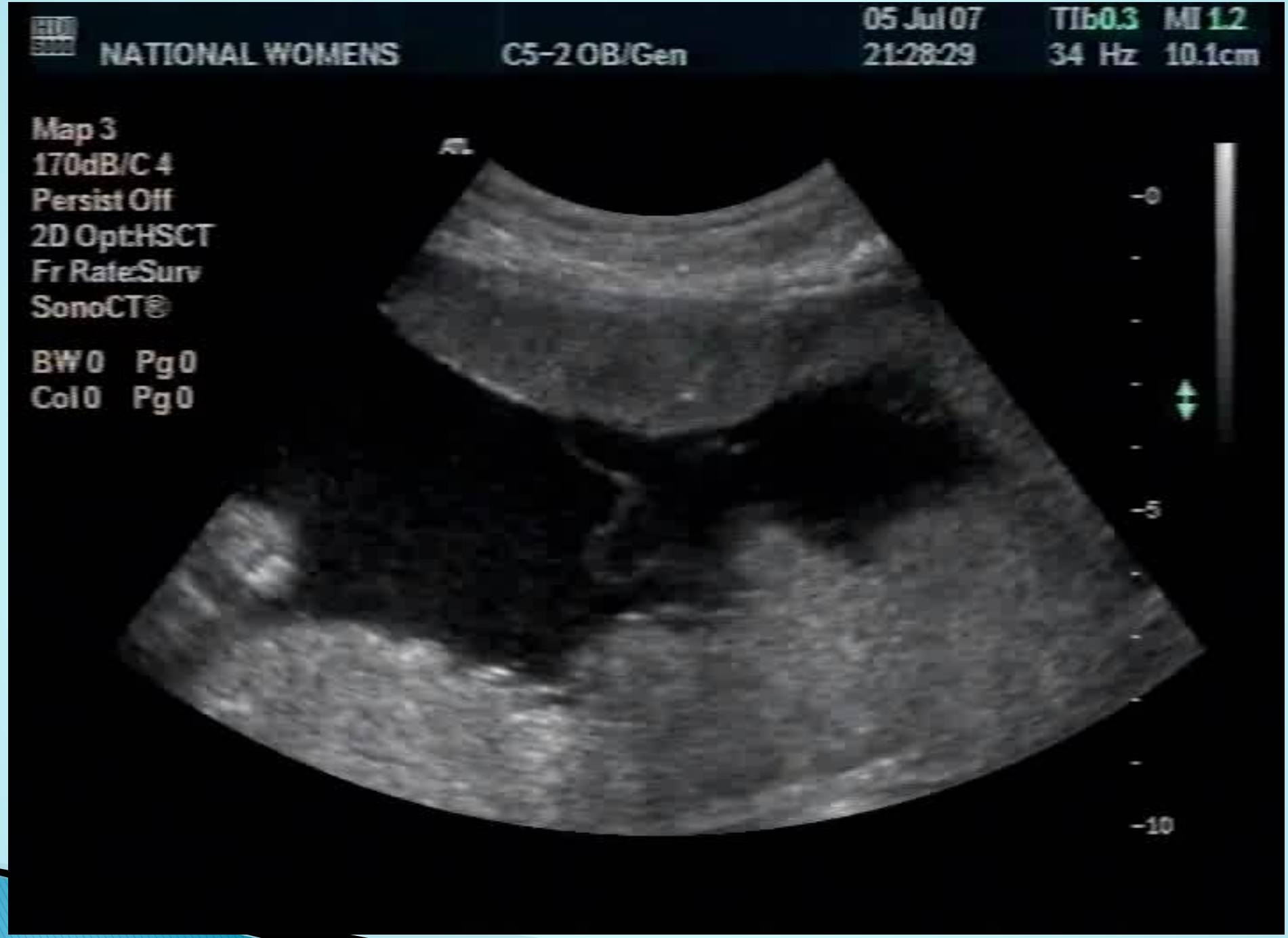
10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TIb 0.3
MI 1.2
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170dB/C 4
Persist Off
2D Opt:HSCT
Fr Rate:Surv
SonoCT®
BW 0 Pg 0
Col 0 Pg 0
AL
-0
-5
-10

# Fifty years ago – Changing Times

| 1960s | 2000s |
| --- | --- |
| Maternal emphasis in obstetric care | The fetus as a patient |
| Fetal problems only detected if maternal problem | Fetal intervention |
| Fetal behaviour unknown | The fetus today – an individual |
| | Prevention–Anti D |
| | Nipocalimab |
| Transfusion based on OD | Prediction –Doppler |
| Fetuses hydropic | Transfusion–U/S guided |
| 2 day procedure | Mortality <3% |
| Intraperitoneal | Prenatal blood grouping |
| High mortality ~50% | Now called HDFN |


PROFESSOR SIR WILLIAM LILEY KCMG FRSNZ
1929 - 1983
PERINATAL PHYSIOLOGIST
FATHER OF FETAL MEDICINE


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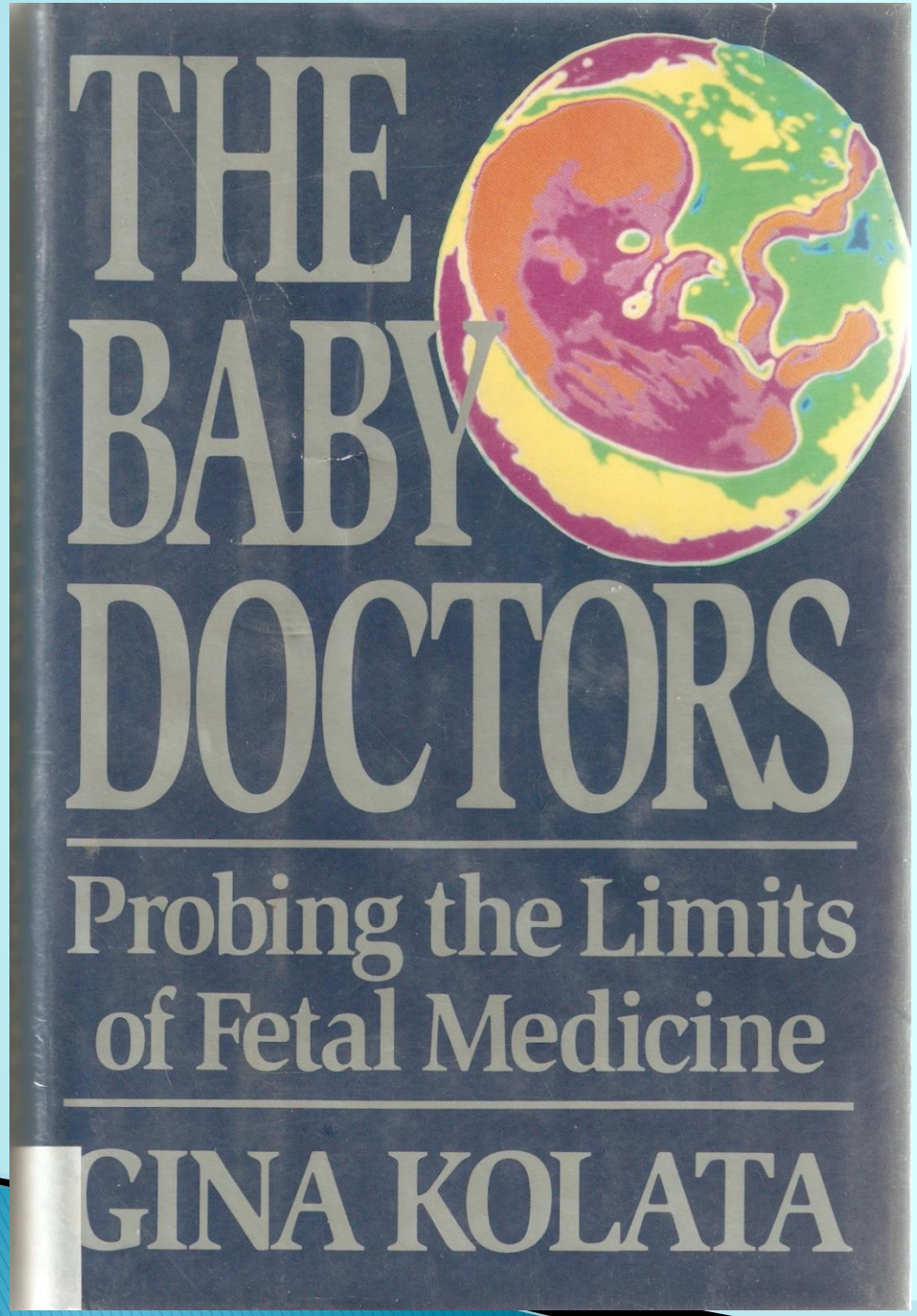
"No longer can we claim and regret that it was possible to monitor the body functions of an astronaut a quarter of a million miles out in space yet be ignorant of the welfare of a baby inches below our fingers".

(A.W Liley.1977 James Kennedy Elliott Memorial Lecture)

What can we learn from him – he changed the course of fetal medicine and surgery

- ❑The fetus is a patient –a challenging concept ≠ mini adult
- ❑ the right treatment for the disease




# The Making of the Unborn Patient

## A Social Anatomy of Fetal Surgery

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