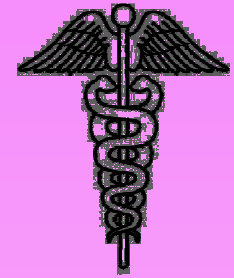




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Techniques of Fetal Reduction and Feticide

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South African Society for Ultrasound in
Obstetrics and Gynaecology



SASUOG CONGRESS 2010

7 – 9 May

Ilanga Estate, Bloemfontein

Introduction

- Clinical practice – 2 decades
- Various **indications** for feticide
 - Multifetal pregnancy reduction (MFPR)
 - Severe fetal anomaly
- Different **methods** described
 - Transabdominal and transvaginal
 - Ultrasound guided or Endoscopic
- SA CTOPA – **any gestation for anomaly**
- **Moral /Social / Psychological / Ethical issues**

Overview

Indications

Techniques

Multifetal Pregnancy Reduction (MFPR) \geq Triplets

- Ideally 11 - 12 weeks
- High order gestation
- Reduction of normal fetuses
- DC - intracardiac KCl
 - Intracranial KCl
- MC - cord occlusion
 - Intrathoracic Amniotic Fluid

Selective TOP (>12 weeks)

- Abnormal fetuses
- R or D twin in TTTS / TRAPS

Twins & Higher Order gestation

- MC - Cord occlusion
- DC - lethal drug injection

Late TOP (>20 weeks)

- Severe fetal anomaly
- Maternal interest

Singleton pregnancies

- Intracardiac injection
- Umbilical vein injection

Multifetal Pregnancy Reduction

-General comments-

- Outpatient procedure / Sedation / Local A
- Extensive counselling (difficult decision / traumatic)
 - Risks & complications
 - Miscarriage (5%) / PROM / PTD
 - Informed consent / Check Rh type
- Experienced operator
- Trained staff – respect views & attitudes
- Appropriate equipment
- Good resolution ultrasound machine

MFPR

- **Main goal** ↓ complications with high order gestations
 - Reduce **perinatal** morbidity and mortality
 - severe prematurity and its consequences
 - prevent neurodevelopmental handicaps
 - Reduce the risk of **maternal** complications
 - Preclampsia
 - Abruptio placentae
- **Essential**
 - Confirm chorionicity / aneuploidy screen(NT) / anomaly scan
 - Determine number of fetuses to be reduced
- **There is generally no medical indication for MFPR in twins**

MFPR - Techniques

- **Transabdominal USG-guided procedure (11-12 wks)**
 - Establish chorionicity / number of fetuses
 - All normal - reduce fetuses close to uterine fundus
 - DC Pregnancy
 - **2-4 mls intracardiac KCl** - harmless dose to mum
 - most common technique
 - **intracranial KCl** (*Lembet et al, 2009*)
 - MC pair – ?TOP both fetuses in DCTA triplets!
 - **intrathoracic Amniotic Fluid** (*Shang-Gwo Horng, et al, 2004*)
- **Transvaginal needle aspiration** <10 weeks –Embryo reduction
 - General Anaesthetic
 - ↑ risk of infection
 - Too early for aneuploidy screen
 - Spontaneous fetal reduction
- **Transcervical aspiration** is no longer used

Intracranial KCl injection

-MFPR in DC pregnancy-

- New technique - First reported case series (2009) Turkey
- Difficulty in reaching the thorax due to fetal position
- Fetal intracranial injection of KCl (2-3mls)
- **Comment:** Technically easier procedure than the intrathoracic approach
- NB: technique should be reserved for selected cases of MFPR by experienced operators

Lembet A, et al. Fetal Diagn Ther. 2009;26(3):134-6

Intrathoracic Amniotic Fluid

-MFPR in MC pair-

- **2 case reports** – DCTA triplets (MC pair) - 10 weeks [Taiwan]
- Outpatient procedure
- 18G needle inserted into amniotic sac under TVS guidance
- 0.5 ml amniotic fluid (AF) aspirated from sac of 1 MC twin
- Needle then advanced into thoracic cavity
- Injected 0.2ml AF - fetal heartbeat ceased immediately
- **Outcome:** 1 - PROM at 25 weeks
2 - uneventful delivery at 36 weeks (>2 kg each)
- **Conclusion:** Intrathoracic injection of AF to create a tamponade is an alternative management for fetal reduction of a MC pair

Shang-Gwo Horng, et al. *J Assisted Reprod Genet*, 2004; 21(9):343-345

MFPR – Outcome

Retrospective study of fetal reduction n=334

MFPR <15 weeks n = 313

- Miscarriage rate - 9.12%
- PTD <33 weeks - 13.33%
- PTD <36 weeks - 38.60%
- Total fetal loss -16.25%
- Median GA at delivery - 35 weeks

MFPR > 15 weeks n= 21

- PTD <33 weeks = 3x ↑
- At least one live neonate - 83.75%

Triplets to twins n=185

- Miscarriage rate - 8.25%
- PTD <33 weeks - 11.18%
- PTD <36 weeks - 40.59%
- Total fetal loss -15.41%
- Median GA at delivery - 36 weeks

Conclusion on MFPR

- MFPR <15 wks - ↓ severe PTD
- Establish correct chorionicity
- Need for 1st T diagnosis

Selective Feticide (SF)

- **Indications (Twins or Higher order gestation)**
 - usually >12 weeks
 - ↑NT in high order gestation for MFPR
 - Acardiac twin, anomalous fetus
 - D or R twin in TTTS
- **DC pregnancy**
 - **Intracardiac KCl** - common method
- **MC pregnancy**
 - **Cord occlusion** - different techniques

Cord Occlusion techniques

-Review of Literature-

Main Goal: Interrupt blood flow to candidate fetus while avoiding exsanguination of the co-twin

- Bipolar cord coagulation
- Cord ligation / compression
- Radiofrequency ablation
- Laser photocoagulation(Nd:YAG)
 - high failure >20wks
- Cord embolisation (Thrombogenic coils/ sclerosants)
 - high failure rate
 - occluding only one vessel

1. Bipolar cord coagulation

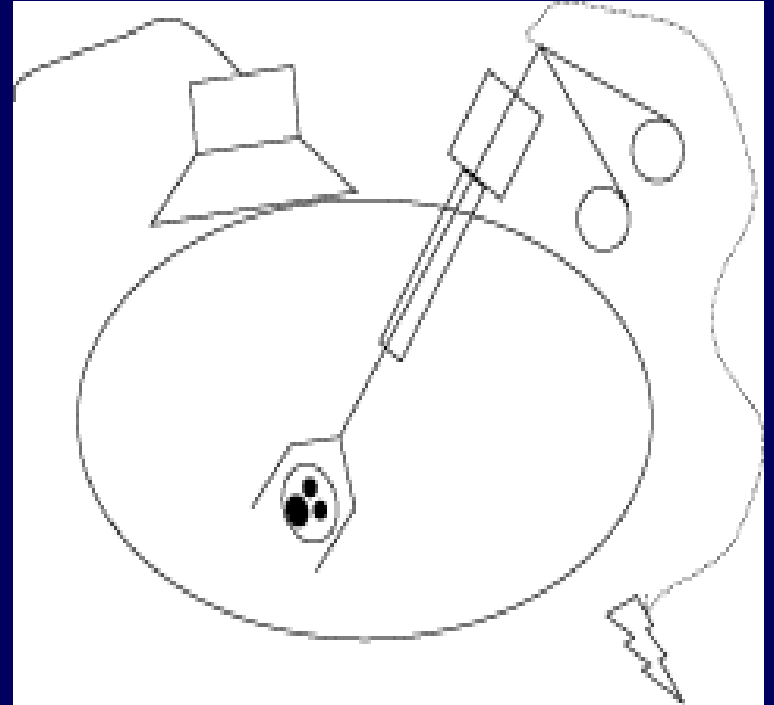
-Gold standard-

- Outpatient procedure/ **Ultrasound guidance**
- **Advantages**
 - Short duration of surgery
 - Single port entry
 - Simple and effective
 - Successfully performed as late as 26 weeks
- Avoid septum disruption → reduce risk
 - Cord entanglement
 - Amniotic band syndrome
- **Complications:** Cord haemorrhage/PROM/PTD

1. Bipolar cord coagulation

-Technique-

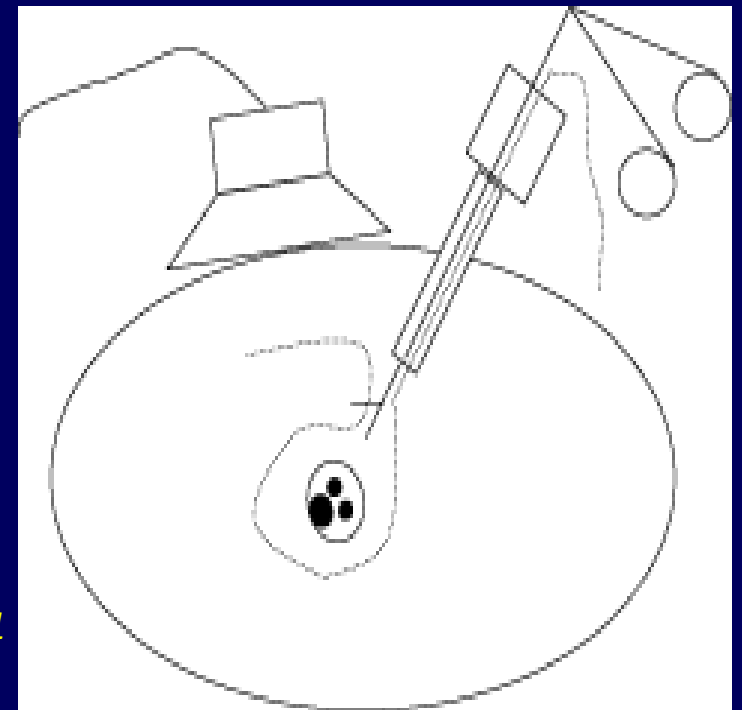
- Ultrasound guidance / cannula inserted [Belgium]
- 3mm endoscopic bipolar coagulation forceps
- Cord loop grasped and coagulation initiated at 20 W power -30s
- Effect judged by appearance of turbulence / steam bubbles
- Power slowly increased to achieve complete occlusion
- Evaluated by color Doppler
- Forceps subsequently freed from cord by gentle manipulation
- Two additional cord segments coagulated in a similar fashion



2. Fetal cord ligation

-Suture Technique-

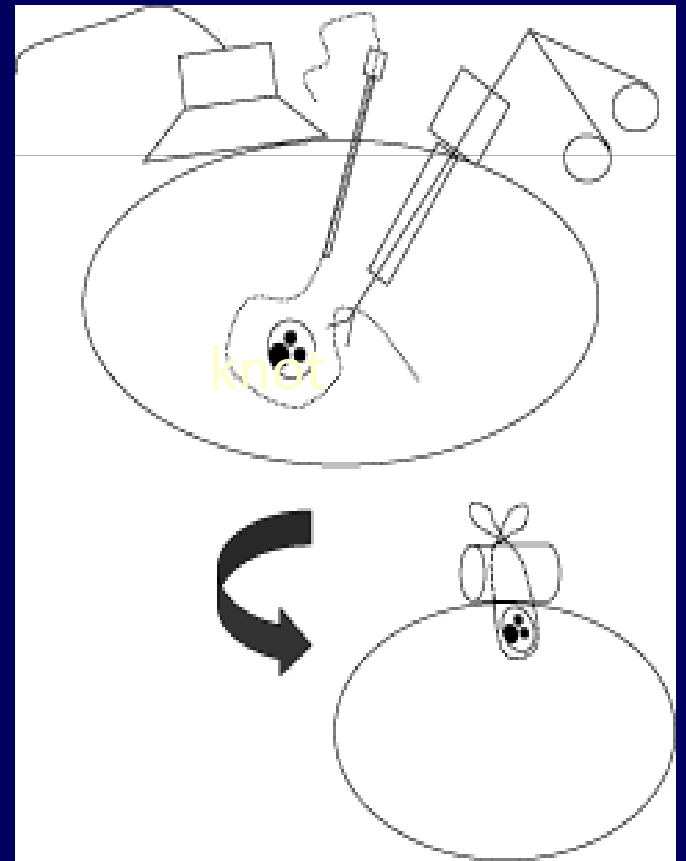
- Case Report of TTTS- **USG guided cord ligation** [France]
- One end of a **monofilament suture** is held by 2 mm biopsy forceps and passed through a 2.1-mm cannula
- Suture hooked over the cord
- The biopsy forceps is then directed under the cord to catch end of suture and pull it out of cannula
- Autostatic Roeder's **knot tied extra-abdominally** and pushed using an Endoloop pushing device



3. Fetal cord compression

-Technique-

- Retrospective observational study - **2 cases – USG guided**
- 2.1mm cannula and an 18G needle **[France]**
- Needle inserted near loop on opposite side to cannula
- **Monofilament suture** passed down needle and caught under cord by biopsy forceps inserted through the cannula
- **Cord compression against uterine wall**
- Achieved by pulling on suture ends and knot above maternal abdominal wall
- Suture untied 24 h later
- If no persistent blood flow on color Doppler- removed



4. Radiofrequency ablation

- **New technique** [Thermocoagulation] < 16 wks [USA]
 - cord coagulation by inducing temperature changes using high-frequency alternating current
 - efficacious technique for selective feticide in fetuses with TRAP sequence
- **Adverse effects**
 - Extent of the thermal damage is not entirely controlled by the operator
 - Intrafetal haemorrhage
 - Amniotic band formation
 - Maternal thermal injuries

Moise. RFA reduction in monochorionic twins. Am J Obstet Gynecol 2008;198(2),191-195.

Radiofrequency needle



Position of needle in fetal abdomen with prongs deployed (*arrow*).



Moise, KJ. Am J Obstet Gynecol 2008:198(2),191-195

Umbilical cord occlusion

Outcomes

- **Systematic Review** n=345 [Italy]
- **Indications**
 - TTTS
 - TRAPS
 - Severe malformation
 - Discordant growth
- **PROM**- complicated all the procedures
 - 59%- within 4 postoperative weeks
- **Demise of surviving fetus** -15%
 - 79% - within first 2 postoperative weeks

Umbilical cord occlusion

Outcomes

- **Survivors per cord occlusion technique:**
 - Radiofrequency ablation - 86%
 - Bipolar diathermy cord coagulation - 82%
 - Laser cord coagulation - 72%
 - Cord ligation - 70%
- **Conclusion:** Systematic Review
 - In spite of favorable outcomes, the optimal surgical approach remains undetermined

Feticide in Late TOP

-Beyond clinical viability-

Contentious issue/ethical implications/ counselling

Indications

- Severe fetal abnormality
 - Maternal interest
- } MDT consensus decision

Methods Transabdominal USG guided procedure

- Intracardiac / intrapericardial
- Umbilical vein puncture
- Heart aspiration till asystole

Drugs

- Lethal: KCl / lignocaine / digoxin / hyperosmolar urea
- Non-drugs: normal saline → cardiac tamponade
- Fetal pain and analgesia [5µg sufentanil injection]

Feticide

-preparation-

- **Experienced operator** / Fetal Medicine specialist
- **Assistant** (doctor)
 - to aspirate heart blood and administer the KCl
 - assist with concomitant procedures if indicated eg: amniodrainage, cephalocentesis, paracentesis
- **Nurse midwife** - attend to patient
 - keep patient comfortable during procedure
- **Scrub sister** – set up / assist with procedure
 - collecting and labelling blood specimens
- **Sonographer / assistant** to 'drive' the ultrasound machine as required during the procedure

Feticide – Intracardiac KCl

- local experience technique-

- **Outpatient procedure** / USG guidance ≥ 24 weeks
- **Premedication** - Pethidine 50mg IVI \pm antiemetic & Mefoxin 2g IVI [30 mins before procedure]
- Cleanse maternal abdomen / ultrasound probe and cord
- Obtain a 4 chamber view - record FHR
- **Free-hand technique** / continuous ultrasound guidance
- **Local anaesthetic** 5mls of 2% lignocaine at entry site
- 20 G 15cm spinal needle - targeting LV or most accessible chamber of fetal heart – initial aspirate blood
- 15% **KCl** administered under direct vision - until asystole
- Rescan 30 mins later – confirm asystole

Results - 5 year Audit

Aug 2003 – Dec 2008

- Gestation: 24-41 weeks [n=2209]
- Prevalence severe fetal abnormality –11.5%
- Acceptance rate LTOP – 75%
- Brain 38% and spine 20% – most common
- Diagnosis to performance of feticide 10 days (0-42 days)
- Mean duration of procedure – 12mins (6-25mins)
- Median volume KCl - 10mls (5-16mls) ($\frac{2}{3}$ cases > 30 wks)
- No maternal complications
- Stillbirths were confirmed in all cases

Other Methods of Feticide

-Review of Literature-

1. Aspiration of blood from fetal heart

- Case series(2009) - report on 9 cases [Turkey]
- Aspirated blood from FH until cardiac arrest
- **Conclusion:** Fetal heart blood aspiration
 - Safe non-drug method of feticide

2. Cardiac Tamponade to induce asystole

- Case report - Taiwan (2009)
- Induce a cardiac tamponade
 - Injecting 10 mls normal saline into pericardial space
 - Fetal demise with minimal maternal risk
- Procedure performed just prior to IOL
 - Following failed 3ml intracardiac KCl injection
- **Conclusion:** Cardiac tamponade (normal saline)
 - safe non-drug alternative of inducing fetal asystole

3. Funipuncture KCl for feticide in LTOP

- French study, (2002) n=10 cases 22-38 weeks
- Umbilical vein puncture under USG guidance
- 5 μ g sufentanil followed by 2g KCl
- No ECG changes observed
- Maternal plasma KCl levels - no significant variations
- **Conclusion:**
 - Umbilical vein KCl safe procedure for the mother
 - allows the fetus to die without pain

4. Use of Lidocaine for feticide in LTOP

- French study n=50 cases 20-36 weeks
 - 7-30mls Lidocaine into umbilical vein (UV)
 - Preceded by 5µg sufentanil injection
- Success rate of 92%
 - one case - resort to intracardiac KCl
 - 3 cases - KCl via umbilical vein
- **Conclusion:** UV puncture for fetal analgesia followed by feticide is a safe procedure for the mother
 - Fetus dies without pain when LTOP is indicated
 - 1% Lidocaine - effective drug for feticide with doses below the toxic dose for the mother

5. Cordocentesis vs Cardiac puncture

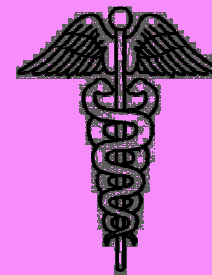
- Retrospective study (2002) UK
- Findings:
 - GA no effect on dose of KCl administered
- Dosage of KCl
 - up to 20 ml for cardiocentesis
 - 8 ml for cordocentesis
- **Conclusion:** cardiac and umbilical routes are safe

-Summary-

- Fetal reduction / feticide – sensitive topic
- Psychological / Social / Moral and Ethical issues
- Decision for feticide - Multidisciplinary team
- Views/ objections of women/ family/ Healthcare Wkrs
- Respect women's autonomy – decision making
- Genetic counselling / informed consent
 - Potential risks & complications of procedures
- Operator experience & expertise
- Choose appropriate technique (MC vs DC)
- Good resolution machine
- Delivery plan/ Postnatal follow up + ongoing counselling



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Thank You

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