

Anesthetic management of pregnant patient after solid organ transplantation

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Dr. Joseph Murray

When Nobel laureate winner, Joseph E. Murray, MD, and his colleagues transplanted a kidney from Ronald Herrick into his identical twin, Richard, on December 23, 1954, it was the first time an organ from one individual had ever been successfully transplanted into another.

It is estimated that as of June 2013, there were
 ~ 200,000 recipients alive with a functioning kidney transplant
 ~ 65,000 recipients alive with a functioning liver transplant.
25% of these recipients are women of reproductive age

ORGAN AND TISSUES THAT MAY BE DONATED FOR TRANSPLANTATION

Organs	Tissues
Lungs	Eye Tissue
Heart	Skin
Liver	Heart Valves
Pancreas	Bone
Kidneys	Tendons
Bowel	Ligaments

Organ Donation

Neurological Death (NDD)

- Heart
- Lungs
- Liver
- Pancreas/Islets
- Kidneys
- Small bowel
- Vessels for future organ transplant

Organ Donation

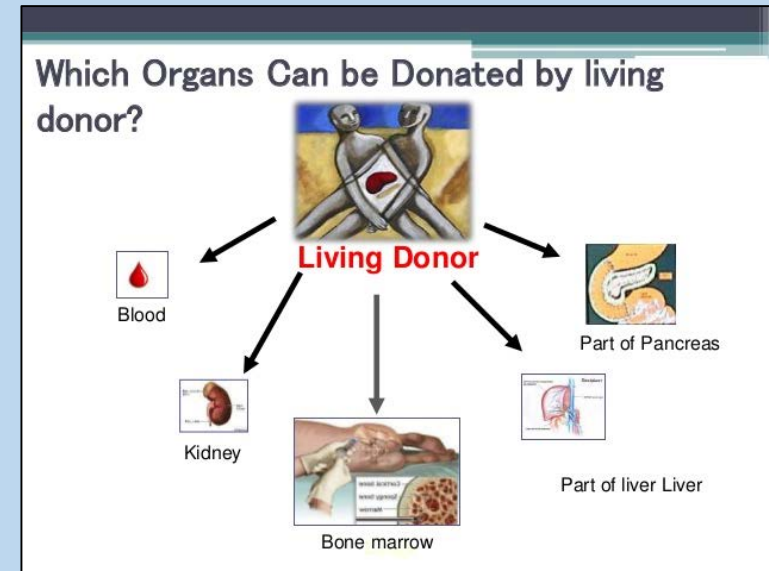
Donation after Cardiac Death (DCD)

- Kidneys
- Lungs
- Liver
- Pancreas
- Vessels for future organ transplant

Tissue Donation

In situations of organ donation with NDD, DCD as well as most deaths

- Bone and tendons
- Eyes and Corneas
- Heart for valve recovery
- Skin



Organ Donation and Transplantation Activities

2014



Last data available: April, 2016



Global Activity in Organ Transplantation 2014 Estimates

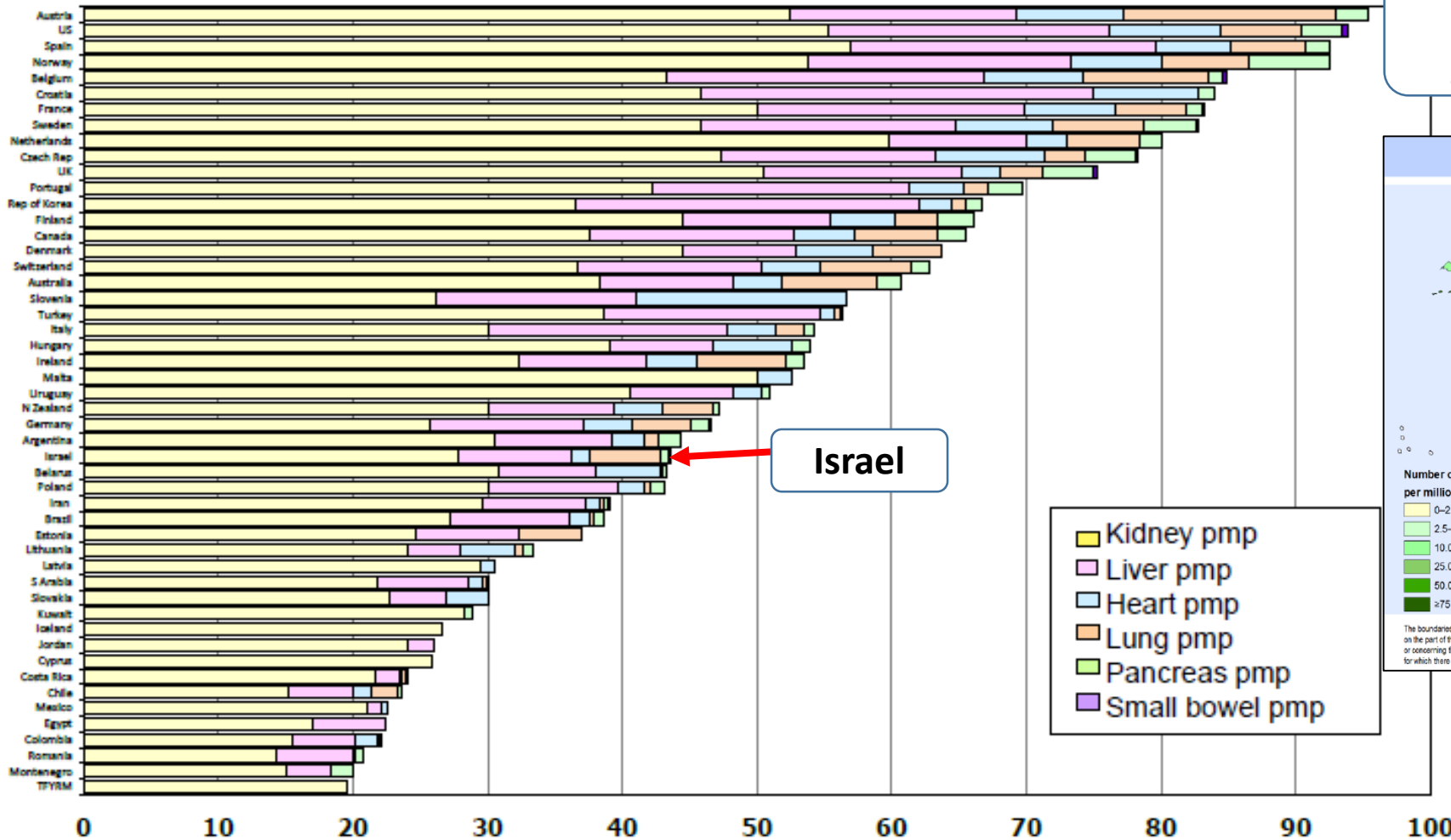
Kidney	Liver	Heart	Lung	Pancreas	Small bowel
79948	26151	6542	4689	2328	215

≈ 119,873 solid organs reported to be transplanted in 2014
 ≈ 1.81 % of increase over 2013
≤ 10% of global needs
 41.6% of living kidney transplants and 19.8% of living liver transplants

Information of 107 Member States on organ transplantation activities is included in the **GODT**: 93 of 2014, 6 of 2013, 2 of 2012, 3 of 2011 and 3 of 2010.

50 Most Active Countries Globally. Transplanted Organs per Million Population

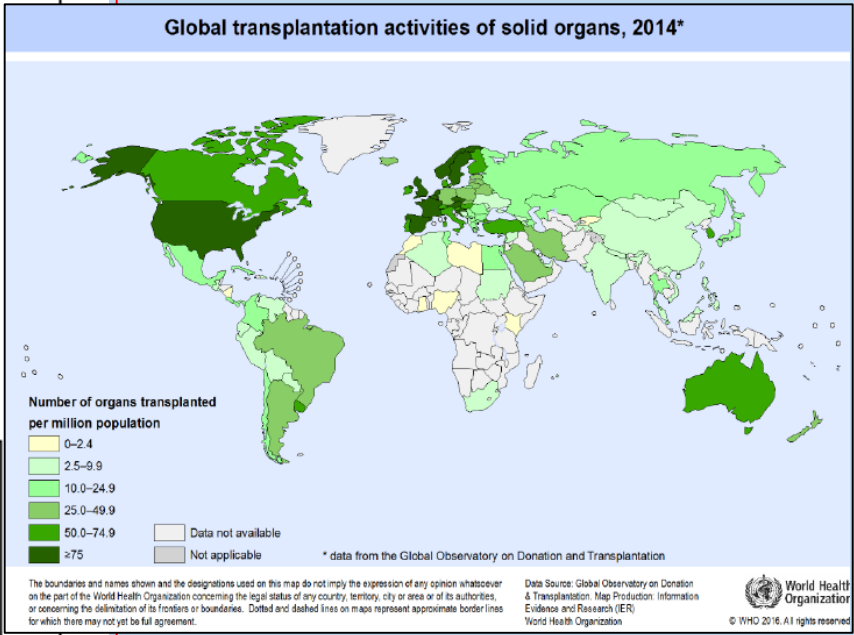
GODT 2014



**Austria
USA
Spain**

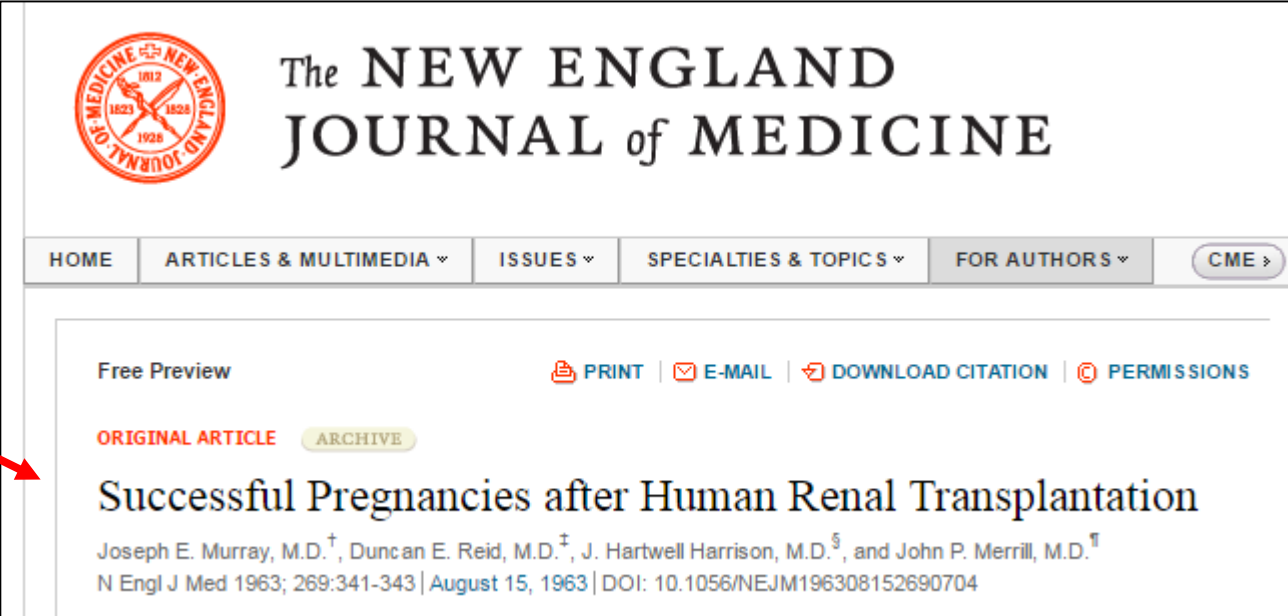
Israel

Legend:
 Kidney pmp
 Liver pmp
 Heart pmp
 Lung pmp
 Pancreas pmp
 Small bowel pmp



1958

- 21 y old patient from Oklahoma
- One of a pair of identical twin females
- With a three year history of chronic glomerulonephritis
 - Uncontrolled HTN 190/120 mmHg
 - CHF
 - Severe oral and gastrointestinal hemorrhage
 - Extra-corporeal hemodialysis
- Successful renal transplantation
- Publication in 1963



The screenshot displays the header of The New England Journal of Medicine website. It features the journal's logo on the left and the title 'The NEW ENGLAND JOURNAL of MEDICINE' on the right. Below the header is a navigation menu with links for HOME, ARTICLES & MULTIMEDIA, ISSUES, SPECIALTIES & TOPICS, FOR AUTHORS, and CME. The main content area shows a 'Free Preview' section with options for PRINT, E-MAIL, DOWNLOAD CITATION, and PERMISSIONS. The article title 'Successful Pregnancies after Human Renal Transplantation' is prominently displayed, along with the authors' names: Joseph E. Murray, M.D., Duncan E. Reid, M.D., J. Hartwell Harrison, M.D., and John P. Merrill, M.D. The publication details are listed at the bottom: N Engl J Med 1963; 269:341-343 | August 15, 1963 | DOI: 10.1056/NEJM196308152690704.

- The first pregnancy after
 - kidney transplantation occurred in 1958
 - and after liver transplantation in 1977
- The National Transplantation Pregnancy Registry (NTPR) began collecting data from recipients in North America in 1991.

Table 1. National Transplantation Pregnancy Registry^a: Pregnancies Registered From January 1991^b to December 2014

Solid Organ(s) Transplanted	Recipients	Pregnancies^c	Live Births
Kidney	986	1742	1333 ^d
Liver	233	431	310 ^e
Liver–kidney	8	11	12
Kidney–pancreas	58	104	77 ^f
Heart	78	133	91 ^g
Heart–lung	5	5	5
Lung	28	37	22
Total	1396	2463	1850

Anesthetic approach to parturient after solid organ transplantation

Question number 1 : Timing of pregnancy after transplantation

- End-stage organ failure → Hypothalamic-Pituitary-Gonadal dysfunction
- Gonadal dysfunction resolved ~ 6 month after renal transplantation
 - Am J Transplant 2005;5:1592–9
- Limited data for heart, lung and heart-lung transplantation
- The **2005** American Society of Transplantation Consensus conference suggested that:
Pregnancy 1 year after transplant is safe as long as the patient has stable graft (renal) function

Timing of pregnancy after transplantation

Graft function

Table 2. Graft Function Assessment of Transplanted Organs During Pregnancy

Transplanted Organ	Graft Function Assessment	Considerations During Pregnancy
Kidney	<u>GFR, creatinine, proteinuria.</u> ³ Creatinine < 1.5 mg/dL and minimal or no proteinuria are defined as indicators of a well-functioning renal allograft. ⁴	Pregnancy changes in kidney function, as well as hypertensive disorders of pregnancy, can confound or mask alterations in graft function. ⁵ Signs and symptoms of preeclampsia such as headache, blurry vision, right upper quadrant pain, elevated LFTs, and thrombocytopenia differentiate preeclampsia from graft dysfunction.
Liver	<u>If liver enzymes (AST, ALT, alkaline transferase) or function tests (bilirubin, INR) are elevated 1.5 times or more than the upper limit of normal, further evaluation is recommended to exclude liver allograft dysfunction.</u> ⁶	During normal pregnancy, alkaline phosphatase levels increase and serum transaminases increase to the upper limit of normal ⁷ ; however, bilirubin level and prothrombin time do not change. ⁸ Therefore, baseline liver function results obtained before pregnancy allow for more accurate interpretation of changing levels during pregnancy.
Heart	<u>ECG, echocardiogram, CXR, cardiac catheterization.</u> ⁹ For evaluation of rejection, the "gold standard" is endomyocardial biopsy, done when there is a clinical suspicion of rejection. ^{9,10} Chronic allograft rejection usually presents as accelerated coronary artery disease. Patients may present with severe dysrhythmias, CHF, and silent MI on ECG. ^{11,12}	At a minimum, a baseline ECG and echocardiogram should be performed. It generally is accepted that rejection rate is not increased in pregnant heart transplant recipients. ¹⁰ Patients however, who had a heart transplant secondary to PPCM appear to be at an increased risk of rejection within the first year after transplant compared with other heart transplant patients and a theoretical risk of recurrent PPCM. ¹⁰
Lung and heart-lung	<u>PFTs, CXR, ABG.</u> When rejection occurs, patients present with symptoms of URI and CXR shows perihilar infiltration or opacification of the graft. Bronchiolitis obliterans indicates chronic rejection. ¹³ PFTs show an obstructive defect with decreased FEV ₁ , VC. ¹³ A-a gradient increases. ¹⁴	Data are lacking regarding adaption of the transplanted lung to pregnancy. Based on a limited case series, the risk of rejection, graft loss, and mortality among lung transplant recipients who become pregnant may be higher compared with other solid organ transplants. ¹⁰

Abbreviations: A-a, alveolar-arterial; ABG, arterial blood gas; ALT, alanine aminotransferase; AST, aspartate aminotransferase; CHF, congestive heart failure; CI, cardiac index; CXR, chest x-ray; ECG, electrocardiogram; FEV₁, forced expiratory volume in 1 second; GFR, glomerular filtration rate; INR, international normalized ratio; LFTs, liver function tests; MI, myocardial infarction; PCWP, pulmonary capillary wedge pressure; PFTs, pulmonary function tests; PPCM, peripartum cardiomyopathy; RAP, right atrial pressure; URI, upper respiratory infection; VC, vital capacity.

Transplant-to-conception intervals of **more than 2 years** were associated with improved mother and newborn outcomes **in liver** transplant recipients.

Coscia LA, Constantinescu S, Moritz MJ, et al. Report from the National Transplantation Pregnancy Registry (NTPR): outcomes of pregnancy after transplantation. *Clin Transplant* 2009;103–22.

Final decision by
Multidisciplinary team with
maternal-fetal medicine expert

Timing of pregnancy after transplantation

Health-Related quality of life after transplantation

- A meta-analysis of 218 studies, with more than 14,000 transplant recipients
 - Overall improvement in all aspects of HR-QOL from pretransplant to posttransplant.
 - The overall HR-QOL for transplant recipients was on par with chronically ill patients and remained lower than healthy individuals

Does transplantation produce quality of life benefits? A quantitative analysis of the literature. Dew MA, Switzer GE, Goycoolea JM, et al. *Transplantation* 1997; 64(9):1261–73.

After successful transplantation, there is a rapid return of fertility. However, in a survey of transplant recipients, 44% were unaware that they could become pregnant posttransplant.

French VA, Davis JS, Sayles HS, et al. Contraception and fertility awareness among women with solid organ transplants. *Obstet Gynecol* 2013;122(4):809–14.

Pregnancy : Yes or No?

גילוי הרדמה

המרכז הרפואי שערי צדק ירושלים

תאריך: 16/8/16

ASA II, AGE 31, WI 64

16/8/16

1/101

IVF

General: Induction: IV Mask Inhalation: Mask Easy/Difficult: Size: Type: IMA: Size:

Regional: Tracheostomy Already used Ventilation: MV/Sp MV/TV/RR Spont

Block: Spinal Epidural Caudal Spinal; Max Level: Paravertebral Coccygeal

Monitoring: SpO2 NIBP IJOG HL/SL FIO2 A-Line CVP PAC Foley PMS TEE ETAA ETCD2 Hot Line Bar Hager Spirometry MGT

מדידים מחליף

SpO2	95	95	95
ETCO2			
PIP			
T			

ד"ר אלכסנדר יוסקוביץ
רופא מומחה בהרדמה
מ.ב. 26545 מ.מ. 17750
מנהל היחידה להרדמה
וילדות בסיכה גבעתיים
מרכז דפויה

- 31y old
- History of
 - Myocarditis + Pulmonary Embolism
 - Cardio/Respirator Arrest +Prolong Resuscitation
- ESRF → Renal Transplantation 2y ago (Cre 1.8)
- CHF (Sever LV and RV dysfunction ;EF 16%)
- CVA (residual neurological sequel, hemiparesis)
- IVF for eggs extraction and pundeaut maternity

Question number 2 - Immunosuppression

- To preserve graft function and prevent rejection
- Mainstay immunosuppressive medication
 - **Corticosteroids**
 - **Calcineurin inhibitors**- cyclosporine, tacrolimus
 - **Antiproliferative agents** – azathioprine, sirolimus, mycophenolate mofetil
- Difficult to maintain appropriate blood levels during pregnancy (secondary to physiologic changes)
- All immunosuppressive medications have fetal and neonatal risk
 - Increased risk of congenital anomalies (especially **sirolimus** and **mycophenolate mofetil**)
 - Premature delivery and IUGR

Immunosuppression

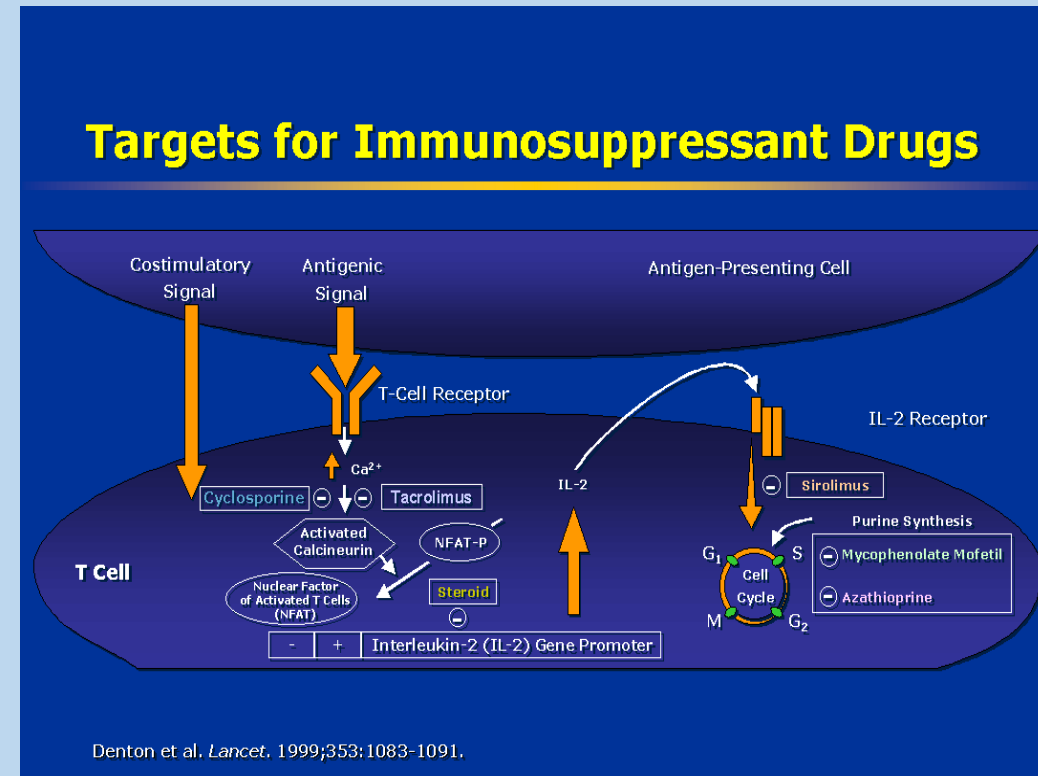
- **Corticosteroids** – Inhibition of leukocyte, macrophage and T-cell activities

Steroid related side effects

- Cushingoid
- HTN
- Adrenal suppression
- Peptic ulcer
- Psychosis
- Glucose intolerance.
- Intra Uterus Gravity Restriction and Preterm Premature Rupture of Membranes

- **Cyclosporine, Tacrolimus** – Inhibition of Calcineurine (Inhibition of T-cell activity)

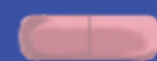
- Metabolized in the liver through the P450 system
- Check maternal blood pressure, blood glucose, Cre and electrolytes
- **Crosses the placenta (50% of maternal level) - immunosuppression of fetus**





**Beaumont
Hospital**

Transplant Medication



Prograf (Tacrolimus)

0.5mg 1mg 5mg

Anti Rejection

Dose varies depending on levels, take at 10am and 10pm. Should be taken on an empty stomach i.e. 1 hour before or 2 hours after food. **Do not take prior to blood level being taken on day of clinic visit.**



Mycolat (Mycophenolate Mofetil) 250mg

Anti Rejection

Take 2 caps at 10am and 10pm. Chemist may supply 500mg tab (purple tablet). Dose may be increased by Renal Team. The only brands you should receive are Mycolat or Cellcept if the chemist cannot supply Mycolat.



Septrin (Co-trimoxazole) 480mg

Antibacterial, used to prevent PCP Pneumonia.

Take 1 tab at night.



Valcyte (Valganciclovir) 450mg

Anti Viral to prevent CMV infections, not all patients will require this therapy.

Dose is dependent upon renal function. Initial dose is usually 1 tablet three times a week. This may increase to one or two tablets once daily as renal function improves.



Ranitidine 150mg

To protect the stomach.

Certain patients will continue on PPI therapy eg. Lanzaprazole, Omeprazole, and not receive Ranitidine.



Prednisolone 5mg

Steroid

Anti Rejection.

Take 4 tabs at 10am. Dose will be reduced by Renal Physician after discharge. Also available in enteric coated tablets.

If unsure please confirm with Transplant Team, Renal Team or Hospital Pharmacist

Disclaimer: This medication information sheet is provided only as an educational teaching tool for transplant recipients. Always follow the advice and training of your individual transplant team. If in doubt regarding any medications/doses, please contact your transplant or renal team.

Please refer to your booklet 'KIDNEY TRANSPLANTATION - A guide for patients' for further information

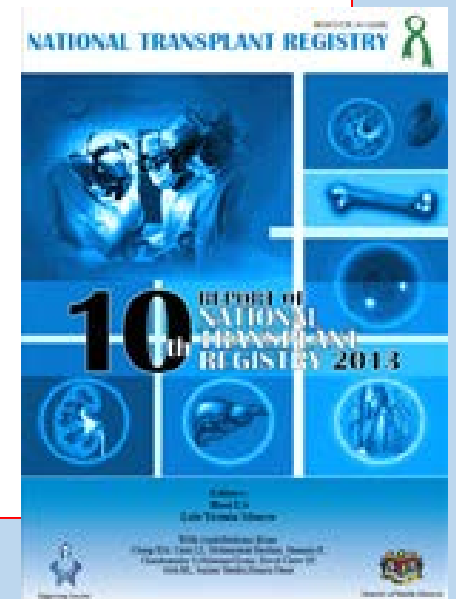
Question number 3 - Comorbidities

- Posttransplantant persist or worsen
 - Hypertension
 - Diabetes
 - Hyperlipidemia } as a result of immunosuppressive medication

Diabetes

- Postrenaltransplantation **pregnant** patient 5-9% (*)
- Postlivertransplantation – up to 13% Diabetes
- Posthearttransplantation – 5-7% Diabetes
- Lung transplant recipient – **max 27% Diabetes**

- Data of National Transplantation Pregnancy Registry reports



• Hypertension

- 25-60% in kidney pregnant recipients
- Up to 35% in liver recipients and Up to 45% in heart recipients
- The worse situation in Lung transplant recipients - **>55%**

• Typical and Atypical signs of infection

- Viral, bacterial, fungal and protozoan
- Hepatitis B and C
- CMV, EBV and Toxoplasmosis

- **No specific recommendations (!?) on prophylactic antibiotics before surgical procedures for immunosuppressed patients**



Kostopanagiotou G, Smyrniotis V, Arkadopoulos N, Theodoraki K, Papadimitriou L, Papadimitriou J. Anesthetic and perioperative management of adult transplant recipients in nontransplant surgery. *Anesth Analg* 1999;89:613-22

Armenti VT, Constantinescu S, Moritz MJ, Davison JM. Pregnancy after transplantation. *Transplant Rev (Orlando)* 2008;22:223-40

Increased Incidence of Obstetric Complication

- Preeclampsia – 30%

Riley ET. Obstetric management of patients with transplants.
Int Anesthesiol Clin 1995;33:125–40

- Preterm labor – 36% (liver) and 54% (renal)*

- Cesarean Section – 50% (liver) *
53% (renal) Ioscovich

Casele HL, Laifer SA. Pregnancy after liver transplantation.
Semin Perinatol 1998;22:149–55

ORIGINAL ARTICLE

Peripartum anesthetic management of renal transplant patients – a multicenter cohort study

A. Ioscovich¹*, S. Orbach-Zinger²*, D. Zemzov², A. Reuveni², L. A. Eidelman², and Y. Ginosar³

¹Department of Anesthesiology, Perioperative Medicine and Pain Treatment, Shaare Zedek Medical Center, Hebrew University Jerusalem, Israel,

²Department of Anesthesiology, Rabin Medical Center – Beilinson Hospital, Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel, and

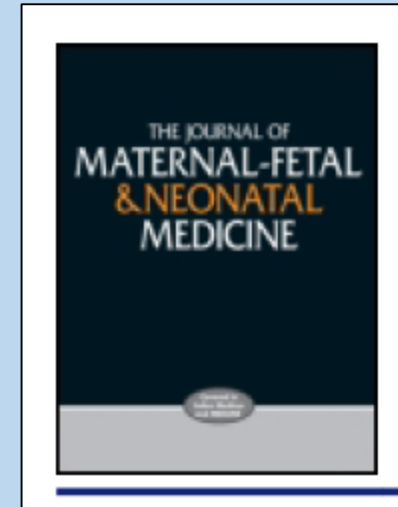
³Department of Anesthesiology and Critical Care Medicine, Hadassah Hospital Hebrew University, Jerusalem, Israel

16 year 1996-2011 retrospective study
~ 30.000-35.000 deliveries annually



Table 1. Baseline data.

Total	64 women, 83 labors
Average maternal age (years)	30.5 ± 5.7 (18–42)
Average time between transplantation and labor (years)	7.5 ± 4.4 (1–20)
Reason for renal transplantation	Unspecified end-stage renal diseases – 35 (55%) Glomerulonephritis–9(14%) Reflux nephropathy–7(11%) Amyloidosis–4 (6%) Polycystic kidney–4 (6%) Diabetes mellitus–2 (3%) One case of Wills tumor, hypoplastic kidney and renal dysplasia
Gestational week	36 ± 0.5 (25–40)
Gravity	2.6 ± 1.9 (1–10)
Parity	0.8 ± 0.3 (0–4) Median range
Number of renal transplants in the past	59 patients (92.5%)–1 transplant 2 patients (3%)–2 transplants 1 patient (1.5%)–3 transplants 2 patients (3%)–combined renal and pancreas transplant



4 CS

Comorbidities

Hypertension 42%

Diabetes 12.5%

Antirejection medication

Prednisone 99%

Tacrolimus 65%

Cyclosporine 54%

Imuran 5.4%

Baseline creatinine (mg/dL)

1.2 ± 0.57 (0.4–4.1)

Baseline hemoglobin
(gm/dL)

10.2 ± 1.68 (7.1–16)

Baseline platelets

223.000 ± 83.000 (106–536)

Baseline white blood cells

11.900 ± 5000 (5–13)

Numbers expressed as mean ± standard deviation (range).

Mode of delivery	NVD 35 (42%) NVD – normal vaginal delivery Instrumental delivery 4 (5%) <u>Elective cesarean section 35 (42%)</u> Emergency cesarean section 9 (11%)
Analgesia for labor	IV analgesia 16 (41%) <u>Epidural analgesia 23 (59%)</u>
Anesthesia for CS	Spinal anesthesia 25 (56.8%) Combined spinal epidural 2 (4.6%) Epidural from labor ward 6 (13.6%) General anesthesia 11 (25%)
<u>Average length of CS (minutes)</u>	<u>60 ± 18 (21–120) primary and repeat CS</u>

Reason for CS 10 (23%) – previous CS; 10 (23%) – maternal medical condition; 8 (18%) – fetal reasons; 7 (15%) – obstetric intrapartum reason; and 9 (21%) – maternal request

Neuraxial Technique for Labor Analgesia and Cesarean Delivery

- Platelet and /or coagulation factor defects secondary to
 - Kidney or liver dysfunction
 - Immunosuppressive therapy (azathioprine, biological agents)
 - Preeclampsia
- **No guidelines** for assessing platelet level and coagulation studies for transplant recipient.
- Patient with **normal graft function** usually don't need additional laboratory assessment of their coagulation status before initiating NAA
- **TEG (?)**

■ NARRATIVE REVIEW ARTICLE

Anesthetic Considerations for the Parturient After Solid Organ Transplantation

Daria M. Moaveni, MD,* Jennifer H. Cohn, MD,* Katherine G. Hctor, MD,* Ryan E. Longman, MD,† and J. Sudharma Ranasinghe, MD*

(Anesth Analg 2016;123:402–10)

Pregnant patients after liver transplantation

Unpublished data from 4 medical centers 1996-2011

N	Age	Reason for transplantation	Years between transplantation and labor	Immunosuppressive therapy	Steroid therapy
1	40	Fulminant hepatitis	12	No	Yes
2	30	Cirrhosis	5	Cyclosporine	Yes
3A	21	Wilson's diseases +Hepatitis B	5	Cyclosporine	Yes
3B	26	Wilson's diseases +Hepatitis B	10	Cyclosporine	Yes
4	31	Autoimmune	9	Prograf	Yes
5	32	Hepatitis C	6	Prograf+ Cyclosporine	Yes
6	27	Cirrhosis	3	Prograf	Yes

- Age 21-40
- 3 - 12y after liver transplantation
- 100% steroid therapy

Pregnant patients after liver transplantation

Unpublished data from 4 medical centers 1996-2011

N	GP	Week gestation	Mode of delivery	Anesthesia	Monitoring	Time of CS	Apgar 1and 5min	Neonatal weight	Blood products or Complication
1	3/1	38	Vaginal	Epidural	Standard		9/10	2864	No
2	1/1	35	CS	General	Standard	60	8/9	1640	No
3A	1/1	40	Vaginal	Epidural	Standard		9/10	2260	No
3B	3/2	35	Vaginal	Epidural	Standard		9/10	3872	No
4	1/1	36	CS	General	Standard	60	5/10	2395	No
5	4/1	38	Vaginal	Non	Standard		9/9	2850	No
6	3/1	38	CS	Spinal	Standard	50	7/8	2860	No

Hepatic Blood Flow:

General versus Regional anesthesia

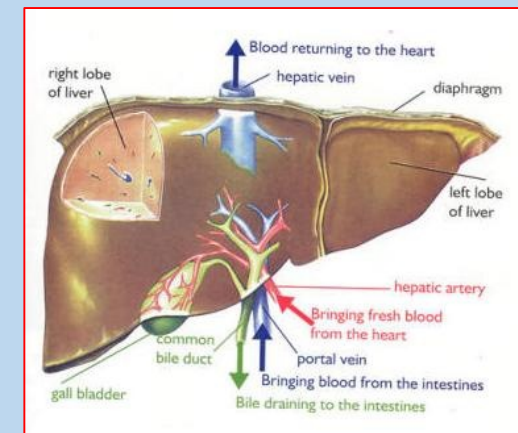
The analysis of available data suggests that general anesthesia affects the splanchnic and hepatic circulation in various directions and to different degrees. The majority of anesthetics decreases portal blood flow in association with a decrease in cardiac output.

[Can J Physiol Pharmacol.](#) 1987 Aug;65(8):1762-79.
General anesthesia and hepatic circulation.
[Gelman S](#)

Vasodilatation
Mechanical ventilation

There are no remarkable studies regarding regional anesthesia efficacy in patients with liver disease.

[Hepat Mon.](#) 2014 Jul; 14(7):
Anesthesia for Patients With Liver Disease
[Poupak Rahimzadeh,](#)



Peripartum/Perioperative monitoring

Review of 69 papers DM Moaveni

ANESTHESIA & ANALGESIA

August 2016 • Volume 123 • Number 2

- “Standard monitoring is adequate in most cases.”
- “Invasive monitoring (IBP or/and CVP) - according to risk-benefit ratio.”
- “Transthoracic or Transesophageal echography for evaluation of left ventricular filling volume for any patients.”

In both our group only one woman (postrenaltransplantation) received IBP (AL) monitoring for CS, secondary to low initial hemoglobin (7.8g/dL) and uncontrolled hypertension.

Blood transfusion concerns



- RBC-antibodies arising from transplanted organs and directed against recipient RBC is a complication of solid organ transplantation.

Ramsey G. Red cell antibodies arising from solid organ transplants. *Transfusion* 1991;31:76–86

- The blood bank **should be contacted early** to avoid delays in cross-matching blood
- To avoid leukocyte-related reaction
 - Leukocyte-poor irradiated blood products should be used
 - Modern leukocyte depletion filters remove 99.9% of leukocytes



Toivonen HJ. Anaesthesia for patients with a transplanted organ. *Acta Anaesthesiol Scand* 2000;44:812–33

Blood transfusion concerns

Our data



Peripartum anesthetic management of renal transplant patients – a multicenter cohort study

A. Ioscovich^{1*}, S. Orbach-Zinger^{2*}, D. Zemzov², A. Reuveni², L. A. Eidelman², and Y. Ginosar³

Peripartum Blood
Products

4 (6%) patients
got 1;2;2;2 Paced Red Blood Cells
1 – Postpartum hemorrhage
2 – Intraoperative bleeding
1 – Baseline hemoglobin 7.8 g/dL

Peripartum Fluid
Administration

Normal saline 8 (9%) 1.8L (1–2L)
Ringer lactate 74 (91%) 1.4L (1–2L)

No blood products in postlivertransplantation group.

Post Lung and Heart transplantation pregnant patients

Table 1. National Transplantation Pregnancy Registry^a: Pregnancies Registered From January 1991^b to December 2014

Solid Organ(s) Transplanted	Recipients	Pregnancies ^c	Live Births
Heart	78	133	91 ^g
Heart-lung	5	5	5
Lung	28	37	22

Data are lacking regarding adaptation of the transplanted lung to pregnancy.

All stress responses are delayed because of denervation.

The risk of rejection, graft loss, and mortality may be higher compared with other solid organ transplants.

Wu DW, Wilt J, Restaino S. Pregnancy after thoracic organ transplantation. *Semin Perinatol* 2007;31:354-62

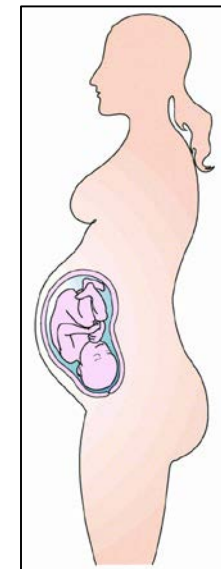
- 23:00
- 28y old P3G0 IVF
- 28w Active labor
- H/O Cystic Fibrosis → ESRF
- S/P Lt lung transplantation (in 14y. Old)
- Severe Scoliosis 145cm /~45kg

- Standard monitoring
- One shot spinal
 - 7.5mg Bupivacaine + MO100mcgm
 - IV Ketamine 20mg+20mg
- Baby – 800gm → Sepsis → died 2w later

Summary



- Pregnant women with solid organ transplants experience
 - Physiologic changes of pregnancy
 - Physiologic changes related to the transplanted graft
 - Side effects of immunosuppressive therapy
- Fetal risks
 - Low birth weigh
 - Prematurity
 - Fetal malformation
- When and how to deliver → multidisciplinary team decision
- Anesthesia
 - Standard monitoring
 - Most women will not have contraindications to NAA
 - Strict aseptic technique is essential (!!!)
 - AB prophylaxis





Best wishes



Welcome to Israel!

The 24th International Conference of
The Israel Society of Anesthesiologists jointly with
The Israel Society of Critical Care Medicine
Anesthesia in the Modern Era: Anytime, Anywhere

November 7-8, 2017, Tel –Aviv



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