Surgical techniques of organ retrieval and transplantation

Seminar IV year medical faculty

Klinika Transplantologii i Chirurgii Ogólnej

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- Transplantation (or transplantation) is a process aimed at restoring some of the functions of the human body by transferring a cell, tissue, or organ from a donor to the body of a recipient

Due to the genetic differences between the donor and the recipient, we distinguish the following types of transplants:

- autologous (made within the same organism),

- isogenic-syngeneic (made between individuals of the same species, genetically identical),

- allogeneic (performed between individuals of the same species, genetically different),allogeniczne (dokonywane pomiędzy osobnikami tego samego gatunku, różnymi genetycznie),

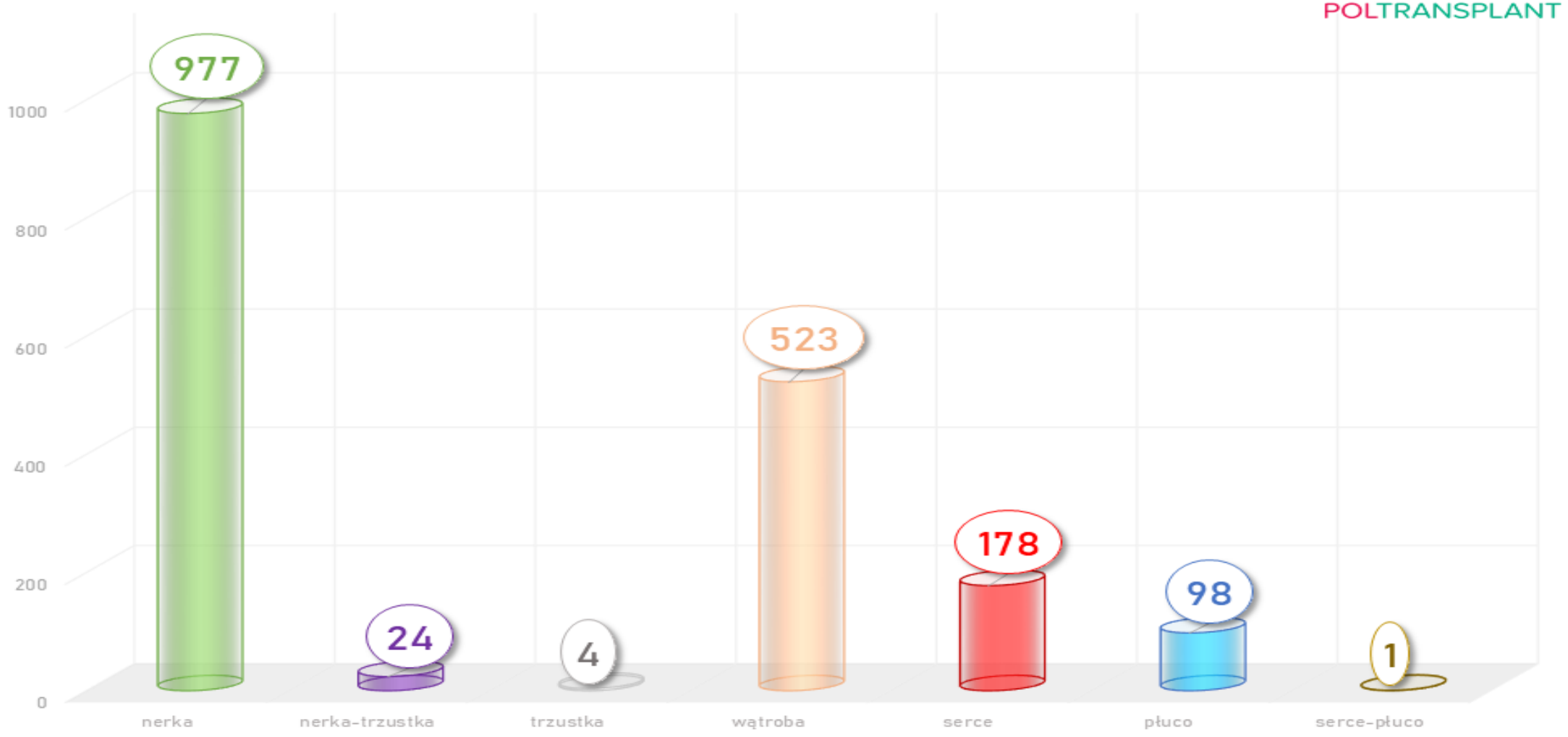
- xenogeneic (occurring between individuals of different species).

Immunologia, red. J.Gołąb, i inni, PWN 2012.

The most commonly transplanted organs and tissues

- Kidney
- Liver
- Heart
- Lung
- Skin
- Pancreas
- Intestine
- bone marrow
- Artery
- cornea

Liczba przeszczepionych narządów pobranych od zmarłych dawców w 2023 r.



https://www.poltransplant.org.pl/

Types of transplants

By type of transplant

Organ

Cellular

tissue

By location

Ortotopic

Ectopic

By organ origin

Autotransplantation

Allotransplantation

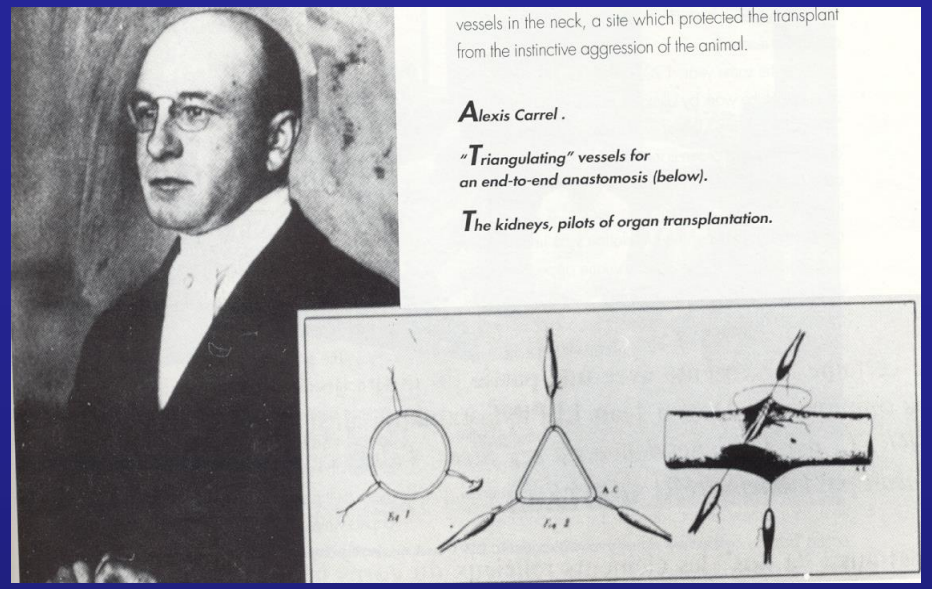
xenotransplantation

1880 – corneal transplantation

1906 – experimental kidney Tx, Jaboulay

1908 - Carrel – kidney Tx

1933 - Voronoy – kidney Tx in human



vessels in the neck, a site which protected the transplant from the instinctive aggression of the animal.

Alexis Carrel.

"Triangulating" vessels for an end-to-end anastomosis (below).

The kidneys, pilots of organ transplantation.

U Woronoy
1929 odkrycie dopełniacza u psów
1933 –przeszczepienie nerki (ryc)
Do 1950 – 6 przeszczepień, czas przechowywania do kilku dni
1949 - przeszczepił nerkę (na udzie) (biorca prawdopodobnie z ostrą niewydolnością nerek), przeszczep działał 4 doby, po czym powróciła czynność własnych nerek; chory później został wypisany ze szpitala w dobrym stanie

1947: David Hume (Boston) przeszczepił nerkę (do dołu łokciowego) u chorej z ostrą niewydolnością nerek ; przeszczep działał dwa dni, później powróciła czynność nerek własnych, przeszczep usunięto

An Illustrated History of Organ Transplantation
Rene Kuss Sandoz 1991

1967 - pierwsze przeszczepienie serca

An Illustrated History of Organ Transplantation
Rene Kuss Sandoz 1991

Transplant surgery

- Organ Harvesting
- Organ Storage
- Transplantation Surgery in the Recipient
- Surgery for Surgical Complications

ORGAN RETRIEVAL

- multi-organ collection: kidneys, heart, liver, pancreas, lungs
- * single-organ: kidneys
- * operating room conditions, donor management during anesthesia as during surgery
- * midline incision
- * exposure of the retroperitoneal space
- * perfusion of organs with UW or HTK fluid
- * collection "en block„
- * preparation for transplantation

ORGAN RETRIEVAL

- **Surgical operation**
- **Complex procedure**
- **Multiple surgical teams**
- **Time coordination**

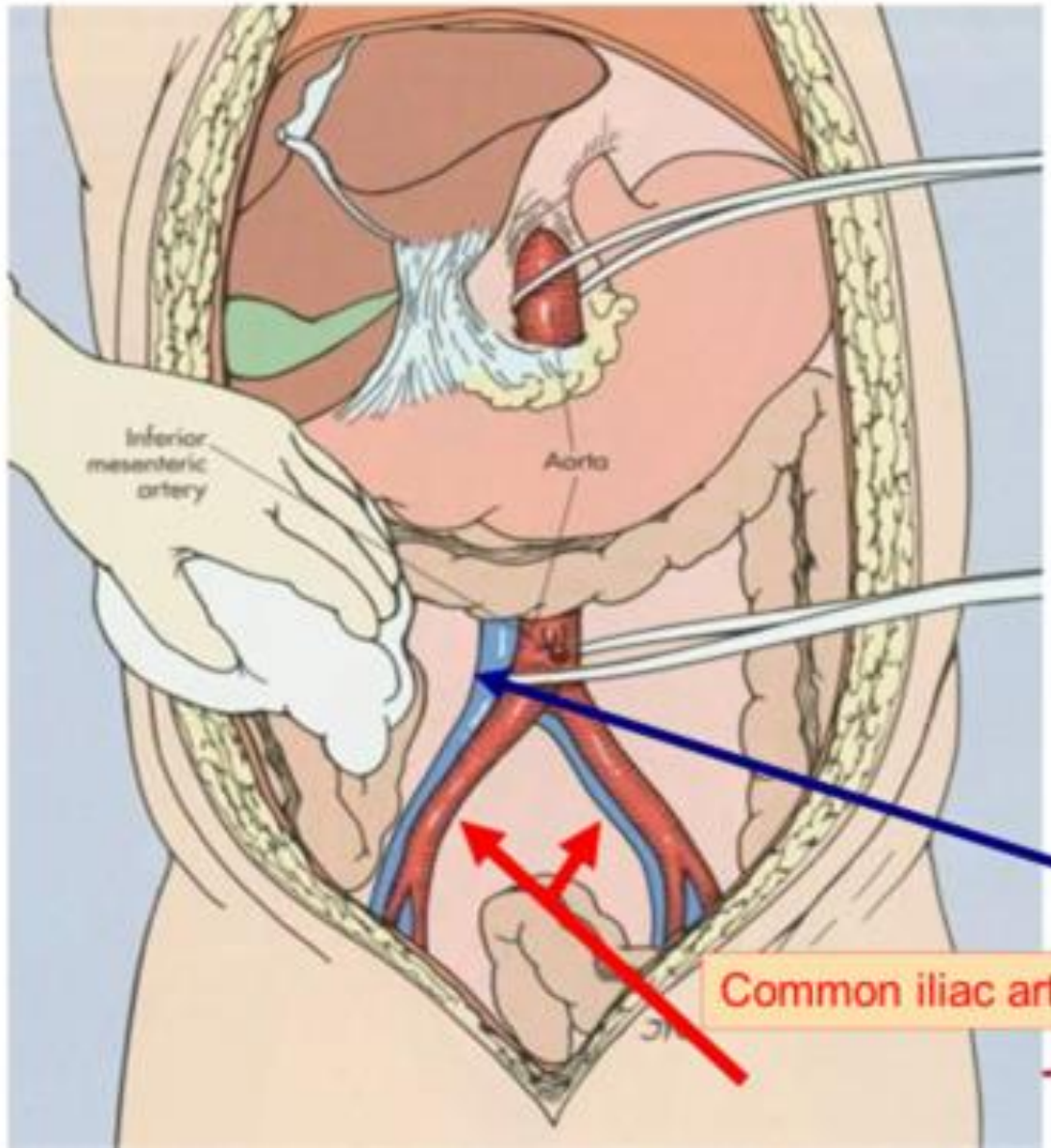
ORGAN RETRIEVAL AND PERFUSION

- **Specific perfusion fluid for thoracic and abdominal organs**
- **Cold ischemia time**
- **Onset –perfusion and cooling**
- **Important for graft function**

Time limits IN SIMPLE HYPOTHERMIA

- 4-6 h heart
- - 12 h liver, lung, pancreas
- - 24 h (-48 h) kidney

Surgical access - Multiorgan procurement



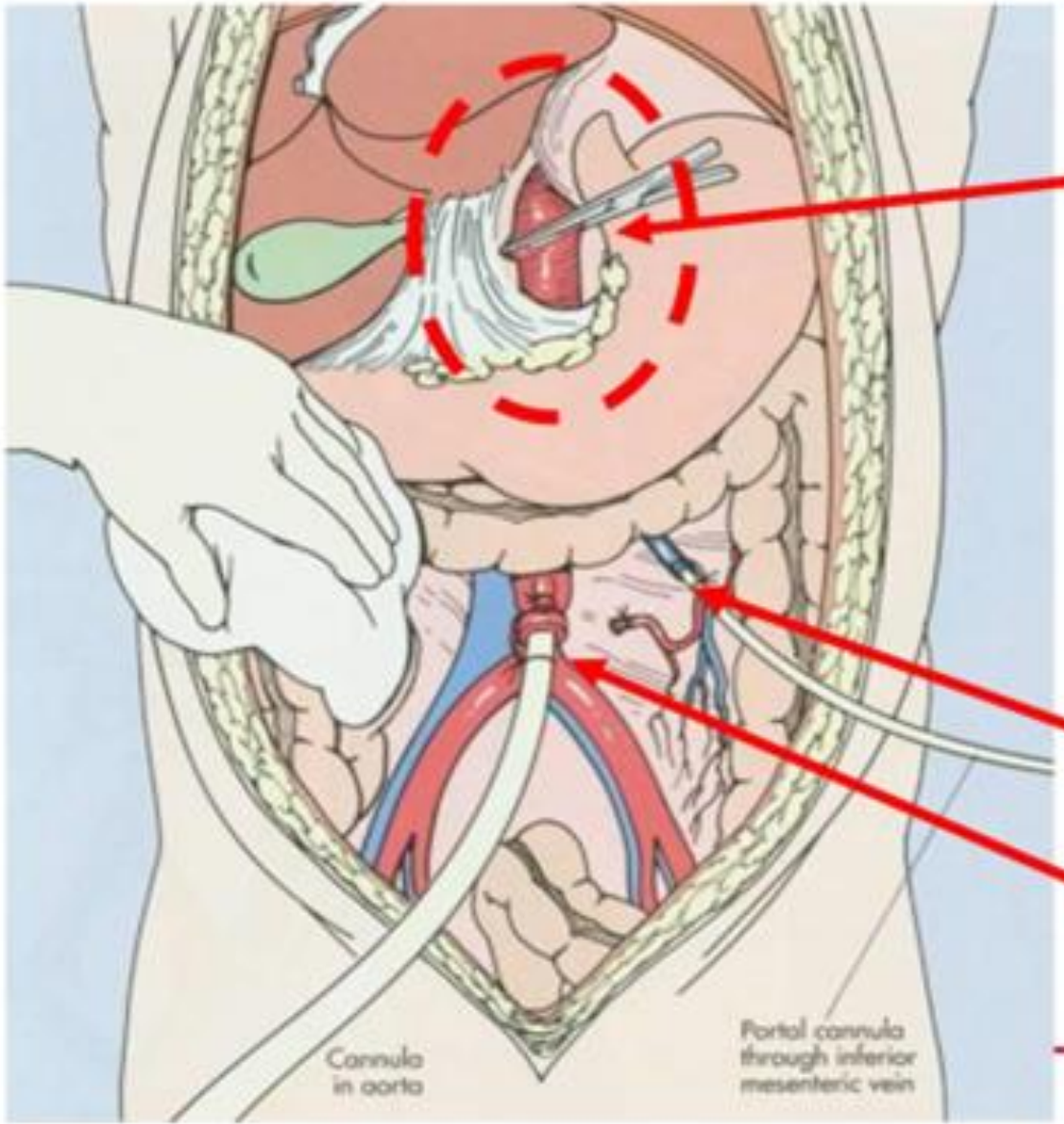
Aorta above the coeliac trunc

Aorta above bifurcation

IVC (inferior vena cava)

Common iliac arteries / pediatric donors

Surgical access - Multiorgan

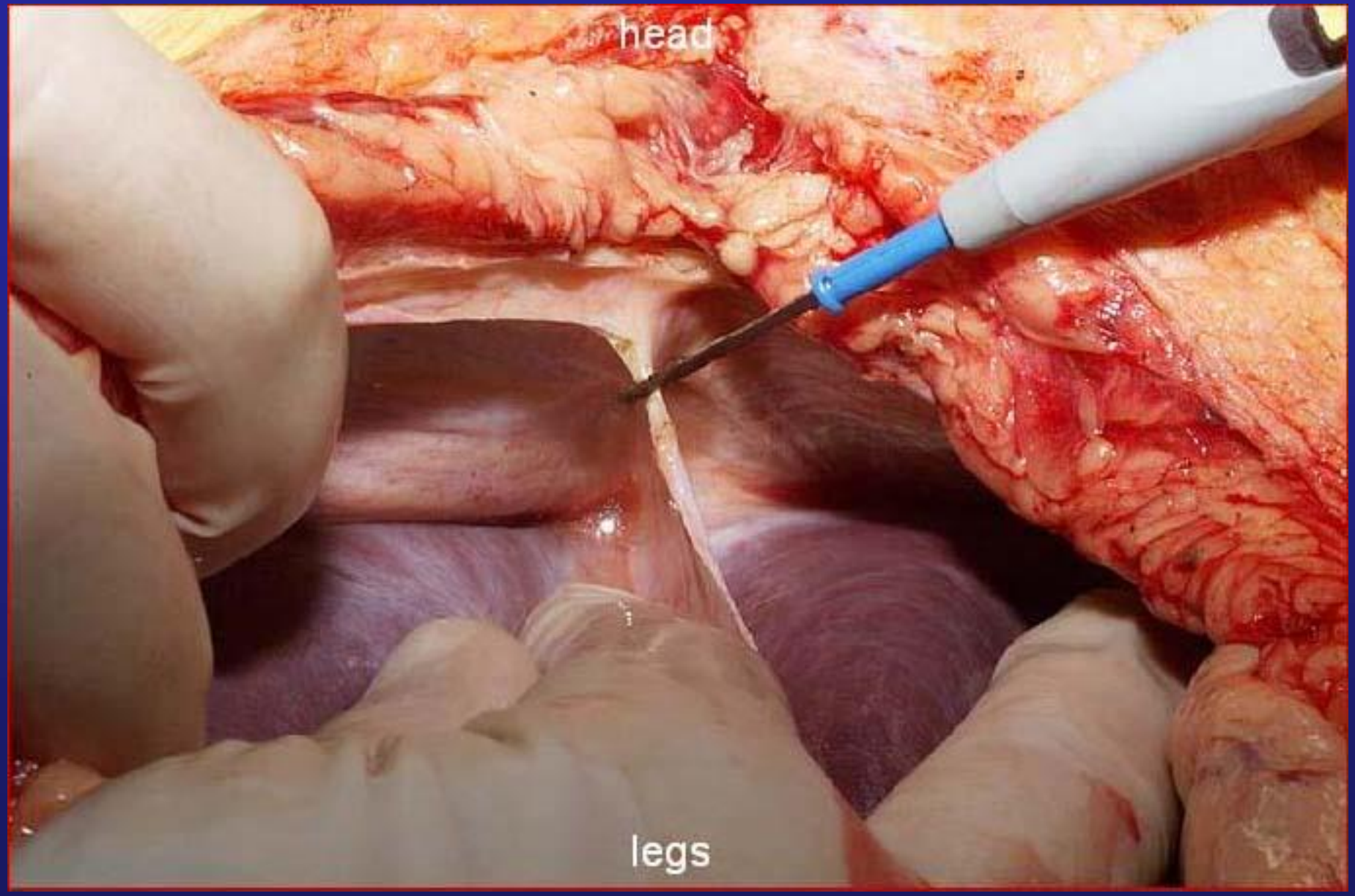


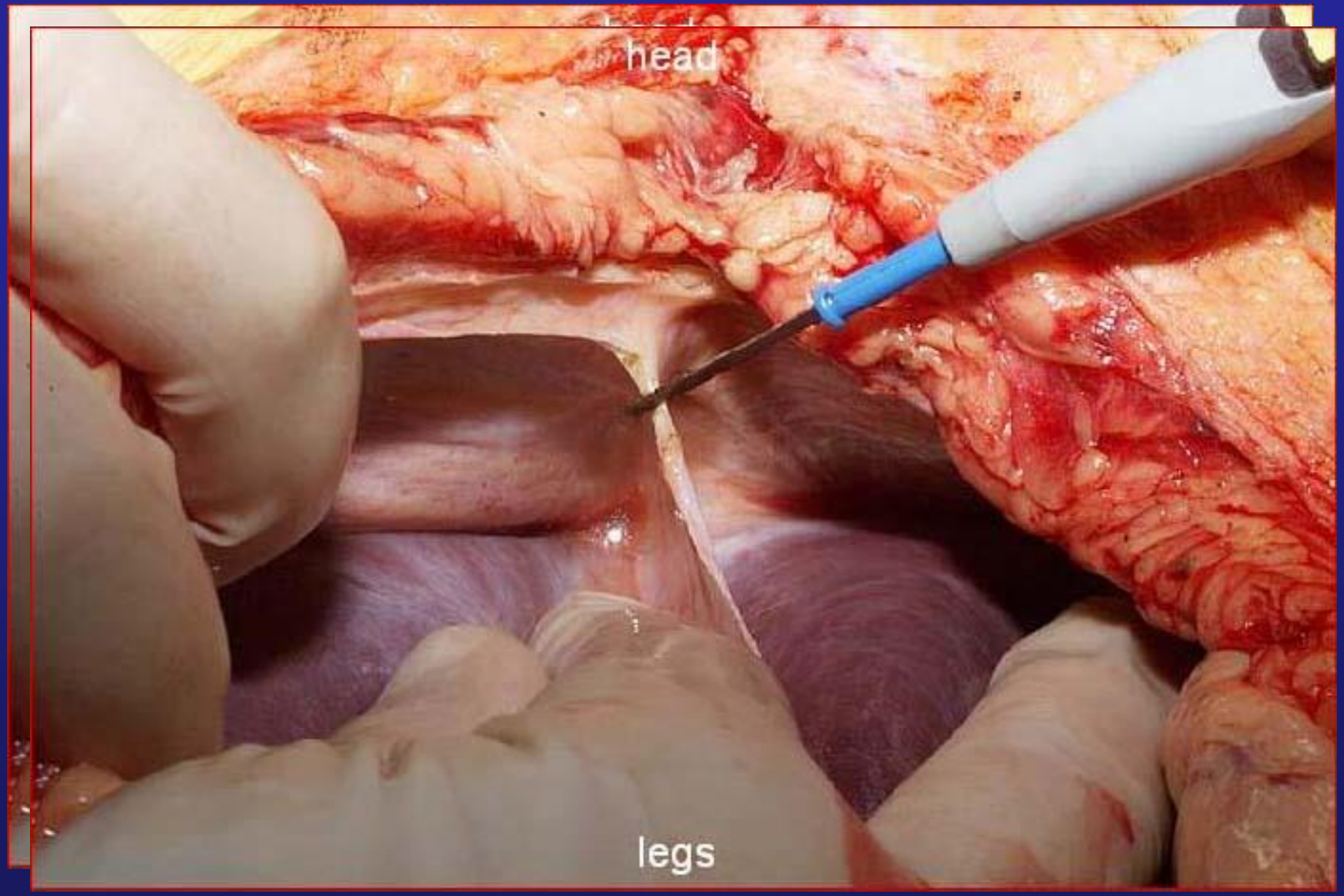
Vascular clamp on the aorta above Coeliac trunc

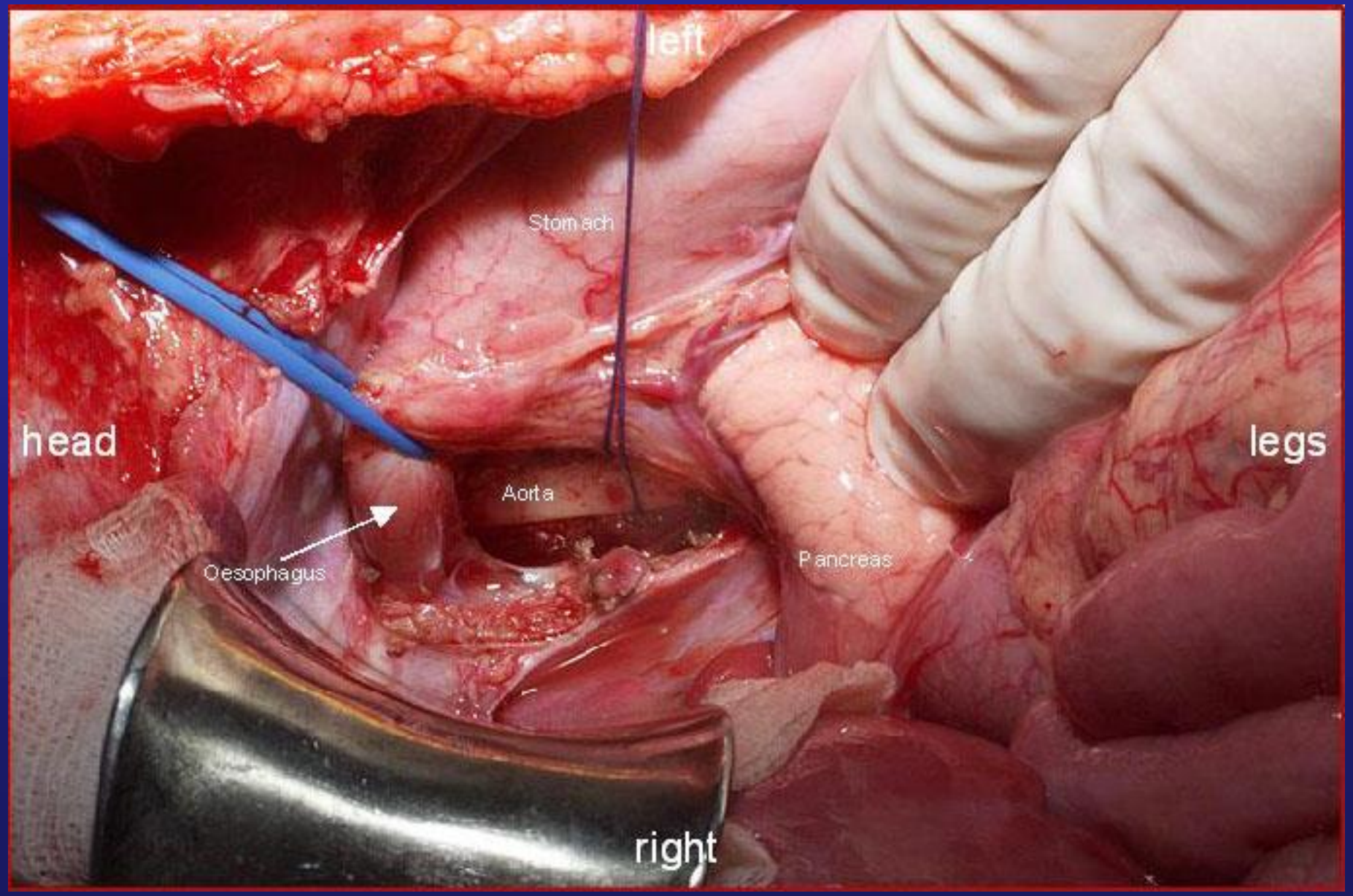
Cave!!! Check CT orifice before clamping !!!

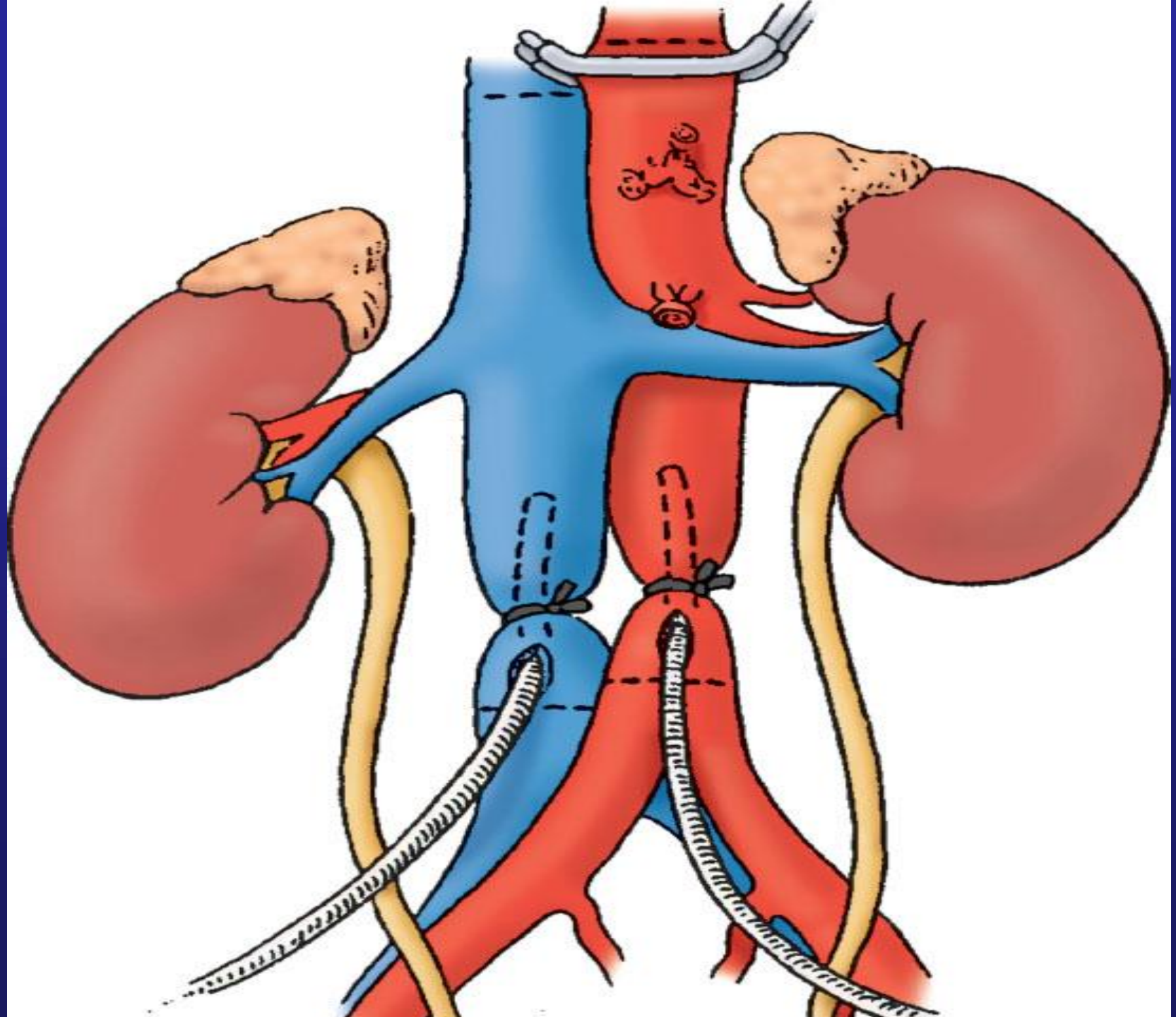
Cannulated IMV

Cannulated distal aorta


head
legs


head
legs


left
Stomach
head
legs
Aorta
Oesophagus
Pancreas
right



Organ preservation

- **Hypothermic 1-4 C**

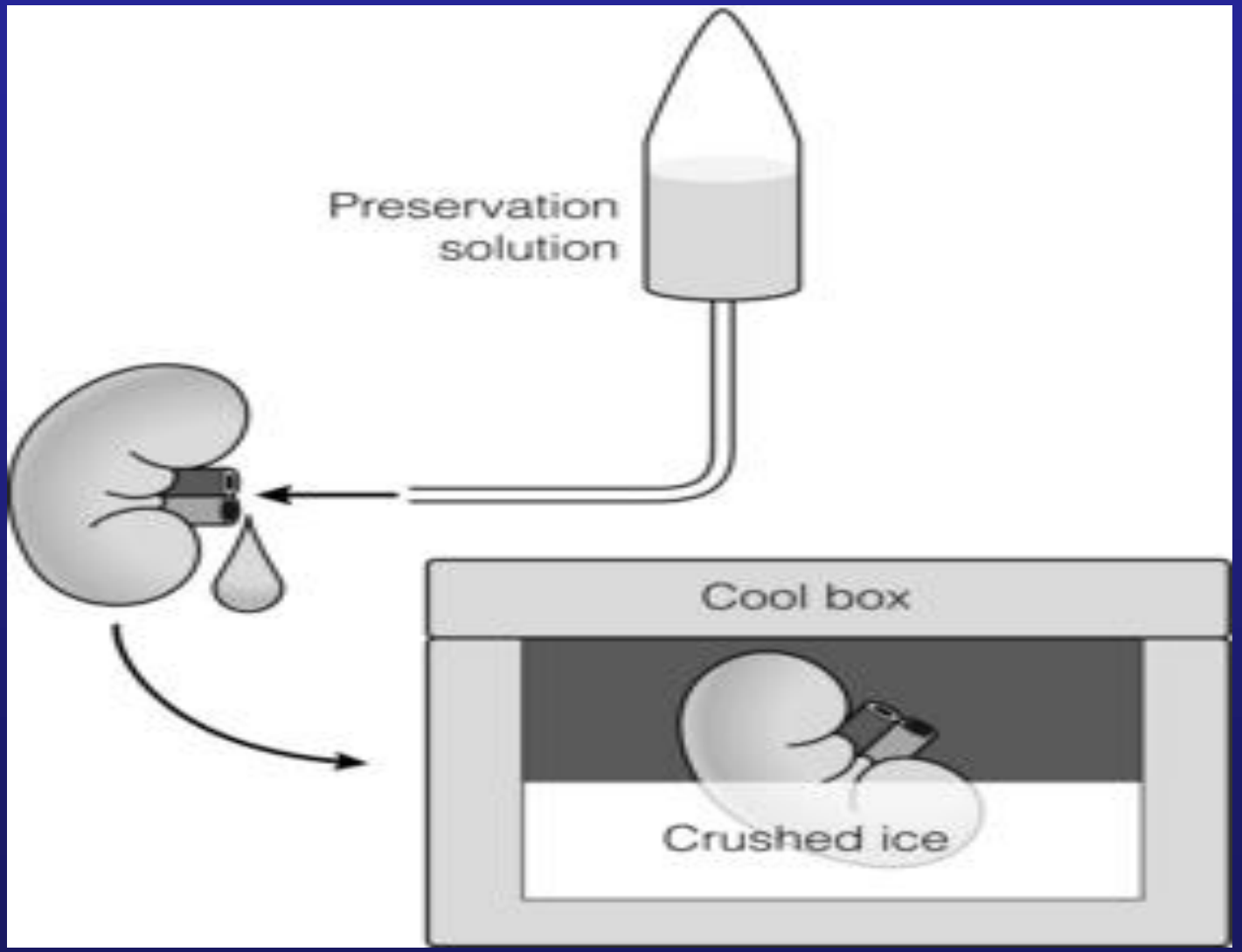
- **Intermittent or continous perfusion**
  - **Hypothermic 1-4 C**
  - **Normothermic**

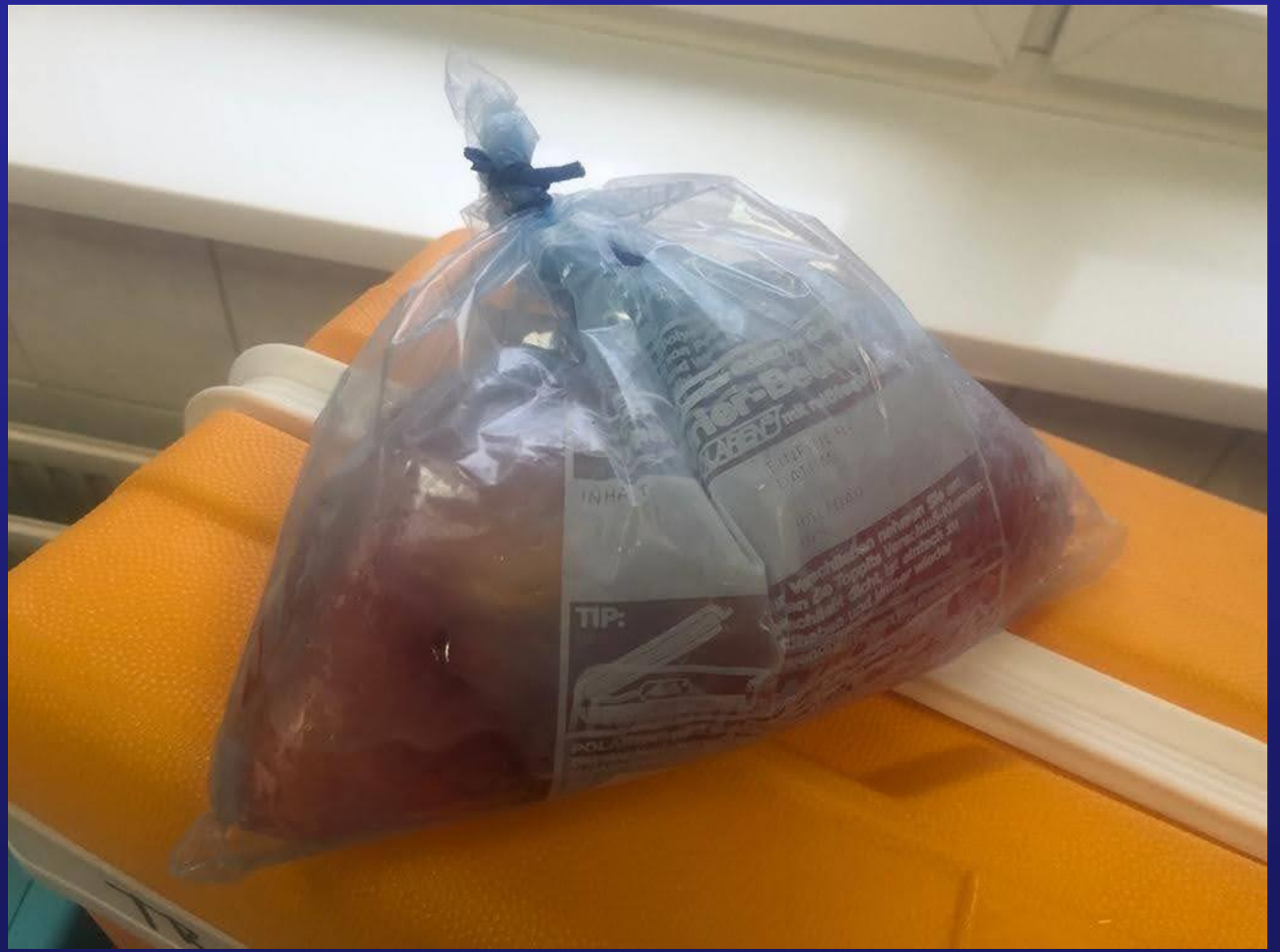

SPS-1®
(UW Solution)
Static Preservation Solution
This product is a sterile, non-pyrogenic solution for hypothermic flushing and storage of abdominal organs.
1000 mL: Static Preservation Solution
Electrolytes (mEq/L): Sodium: 29, Potassium: 125
Osmolality: 310 ±15 mOsm/kg
Delivered Volume Markings are approximations.
CAUTION: Do not use if frozen, cloudy or exposed to extreme heat
CAUTION: Not intended for direct injection or intravenous infusion. High Potassium Content - Risk of Cardiac Arrest
℞ Only CAUTION: Federal (USA) law restricts this device to sale by or on the order of a physician
REF SPS1_1 LITER
LOT PBR-0060-448
2020-09-22
(01) 0 0818045 02030 8
(10) PBR-0060-448
(17) 200922
440-00055 Rev. D
200
400
600
800

Static Cold Storage (SCS)

- Wash with sterile hypothermic preservation solution
- Kidney core temperature → 0-4°C
- Store in ice water

Image source: St. Louis Public Radio


Preservation solution
Cool box
Crushed ice



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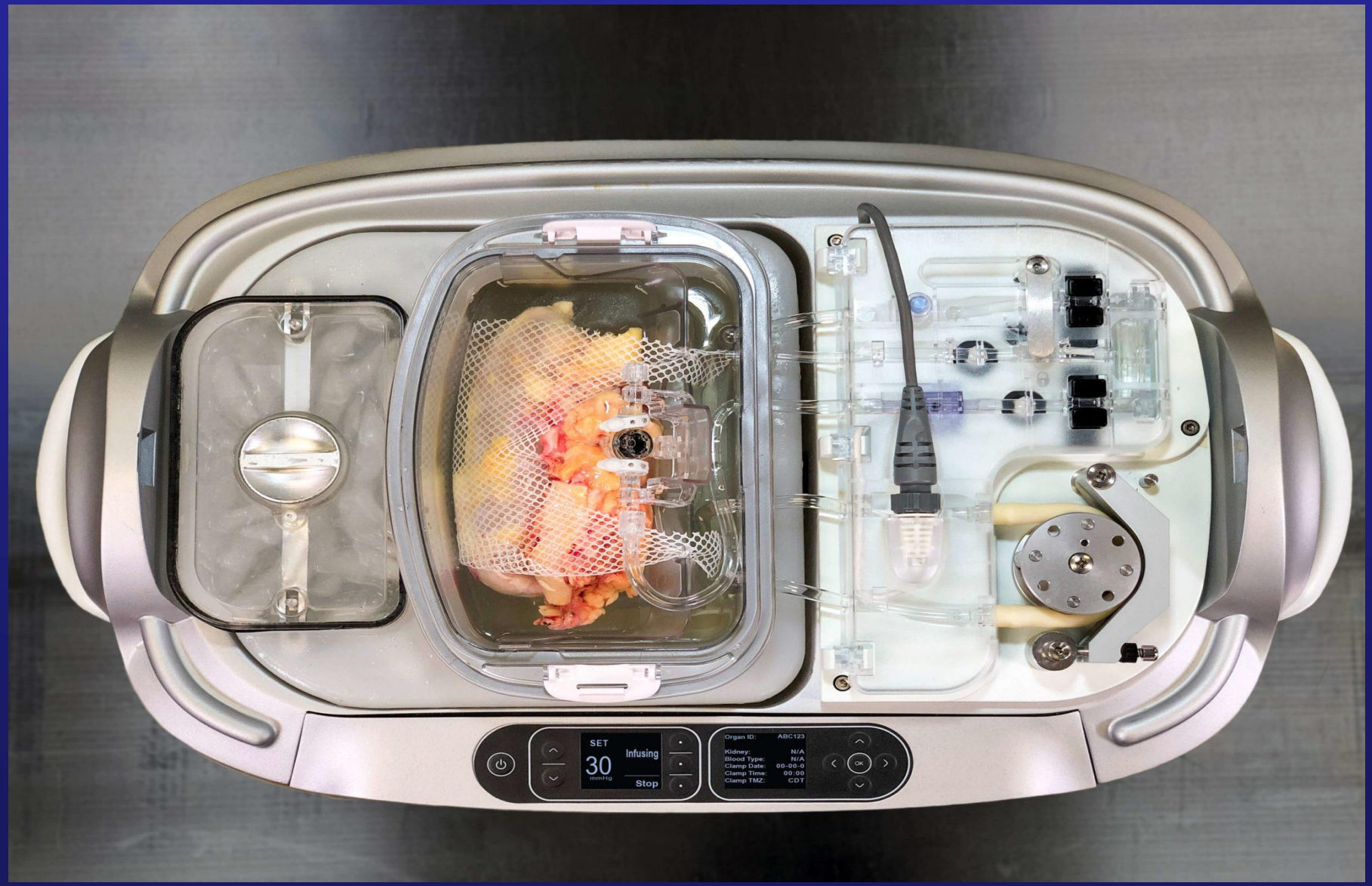
Wszystko gotowe…

Fot.Piotr Myczko



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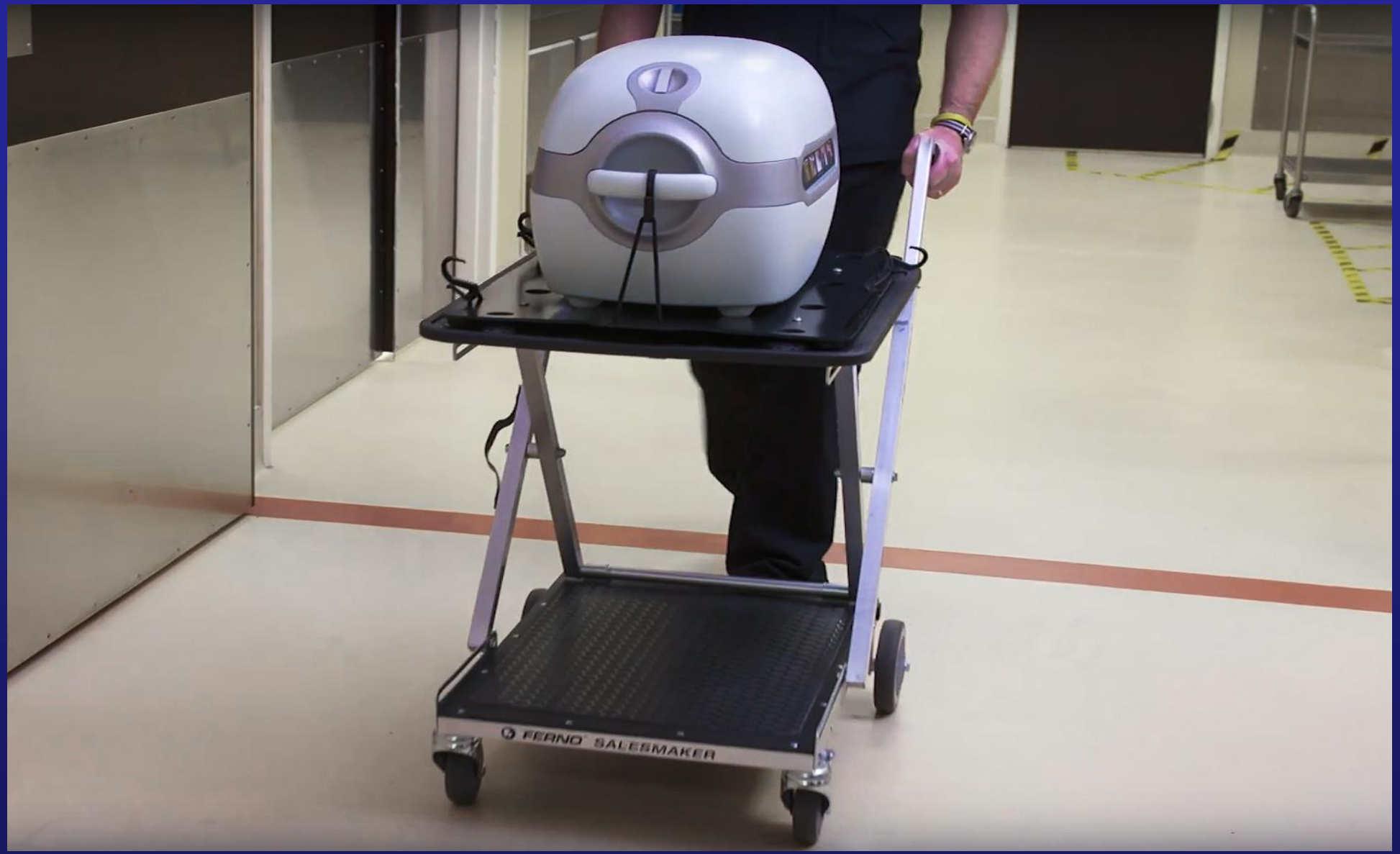

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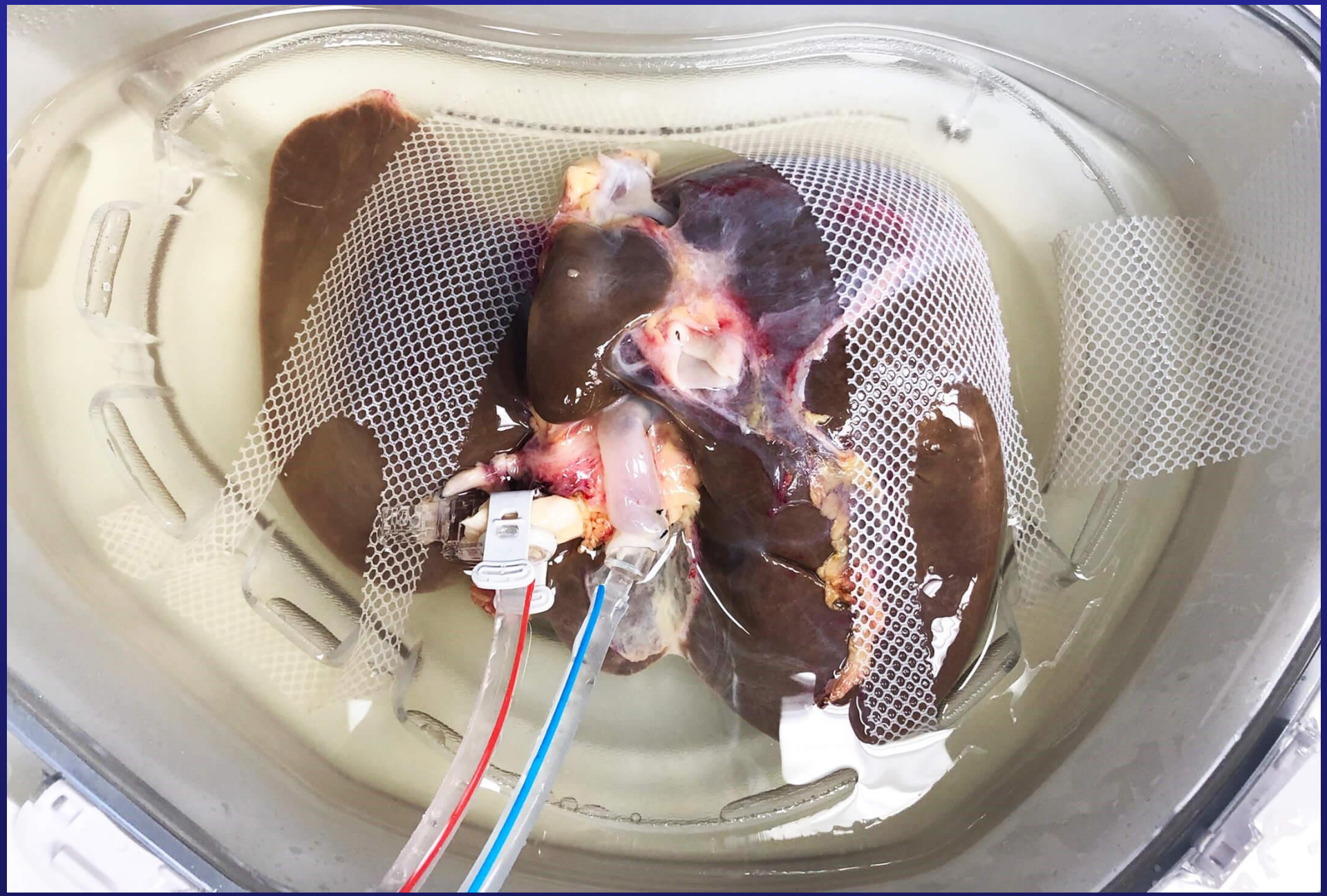

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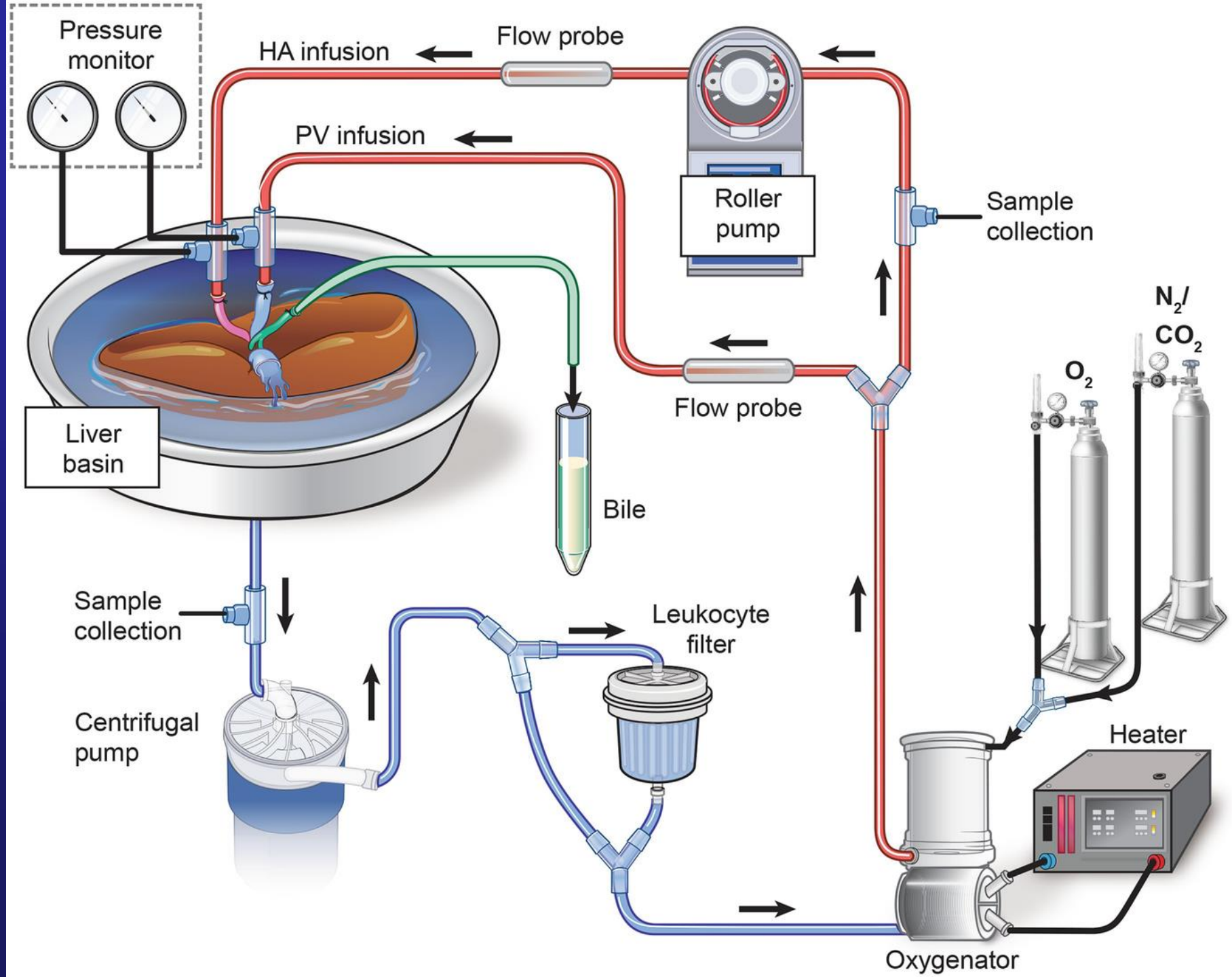
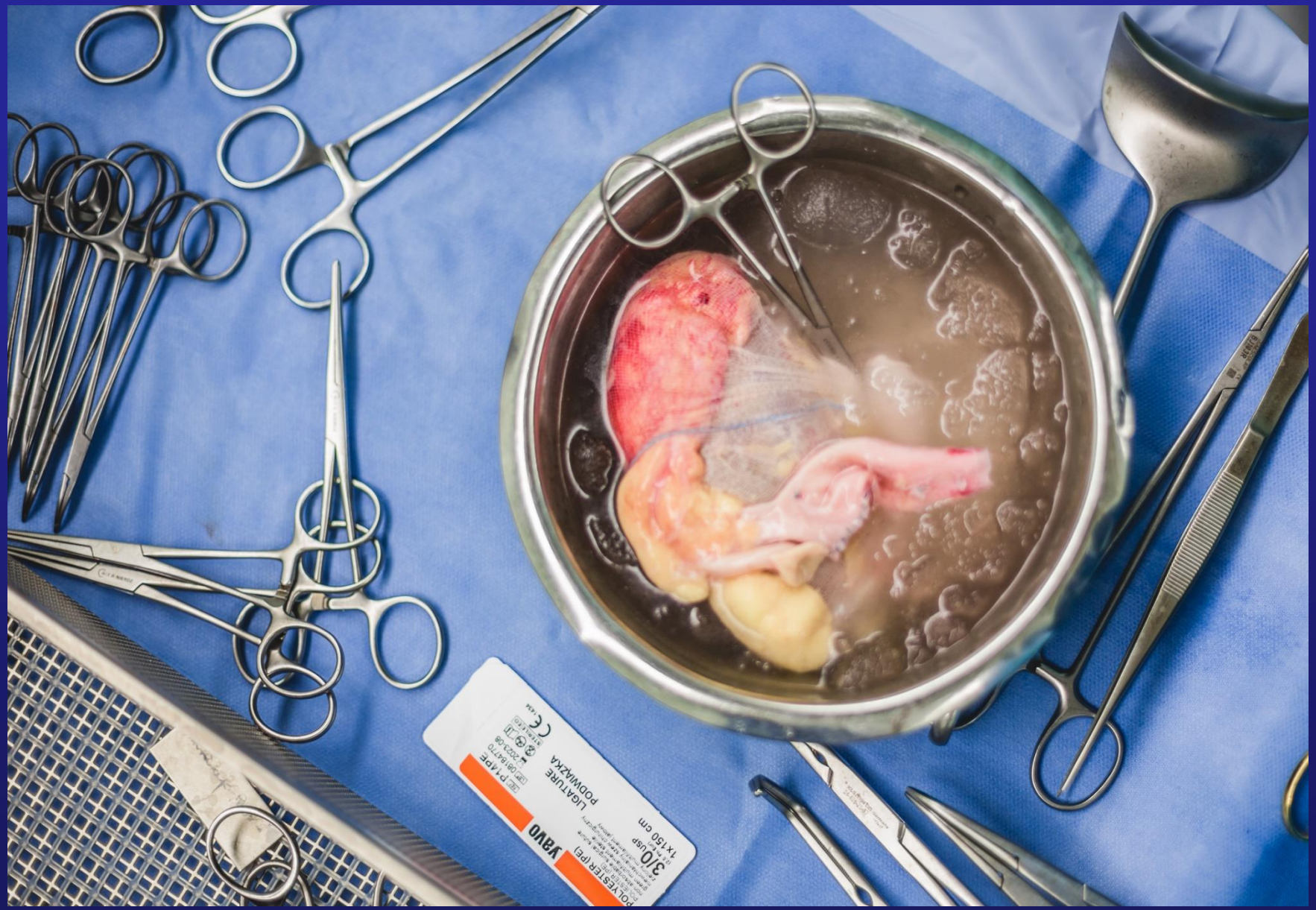

Pressure monitor
HA infusion
Flow probe
PV infusion
Roller pump
Sample collection
N_2/ CO_2
O_2
Liver basin
Bile
Flow probe
Sample collection
Leukocyte filter
Centrifugal pump
Heater
Oxygenator



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Preparing the kidney for transplantation

Fot: Piotr Myczko


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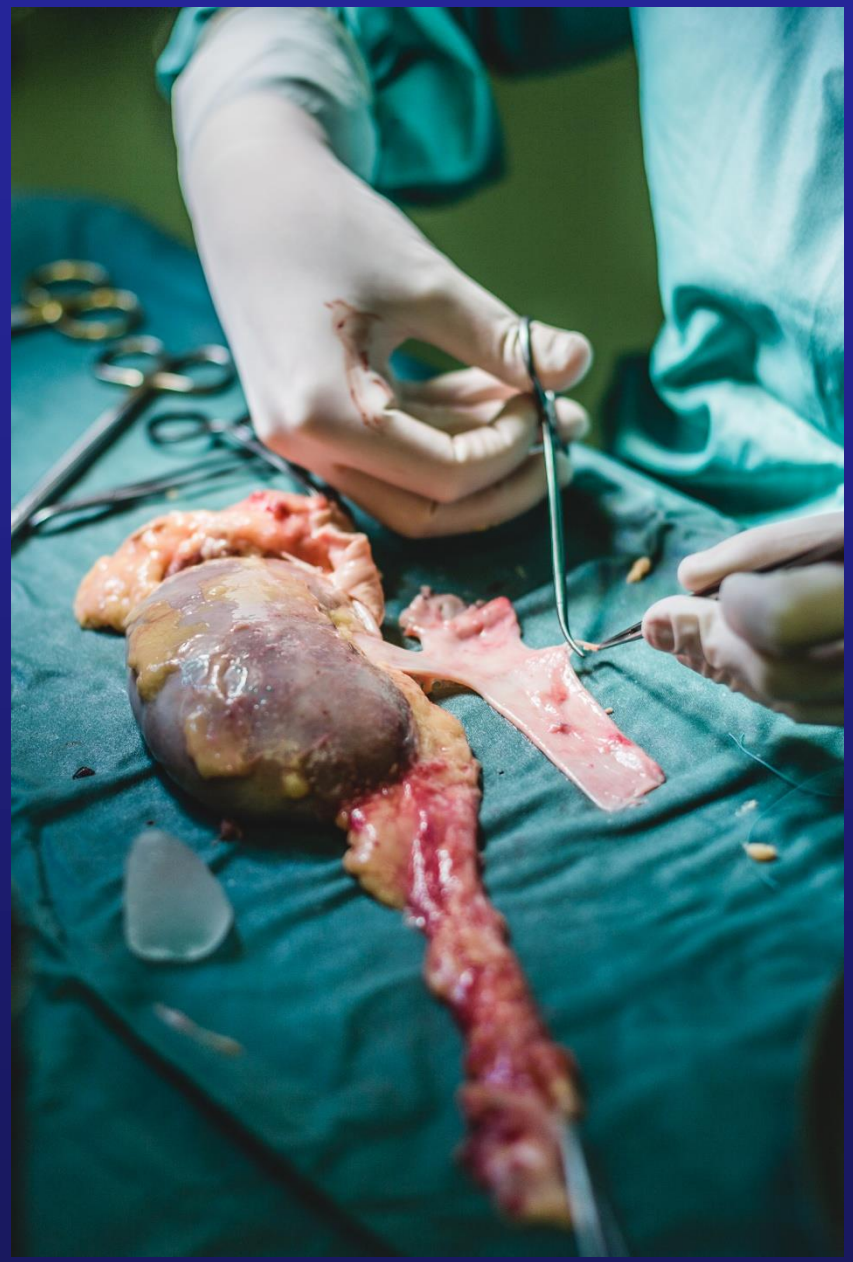
Preparing the kidney for transplantation



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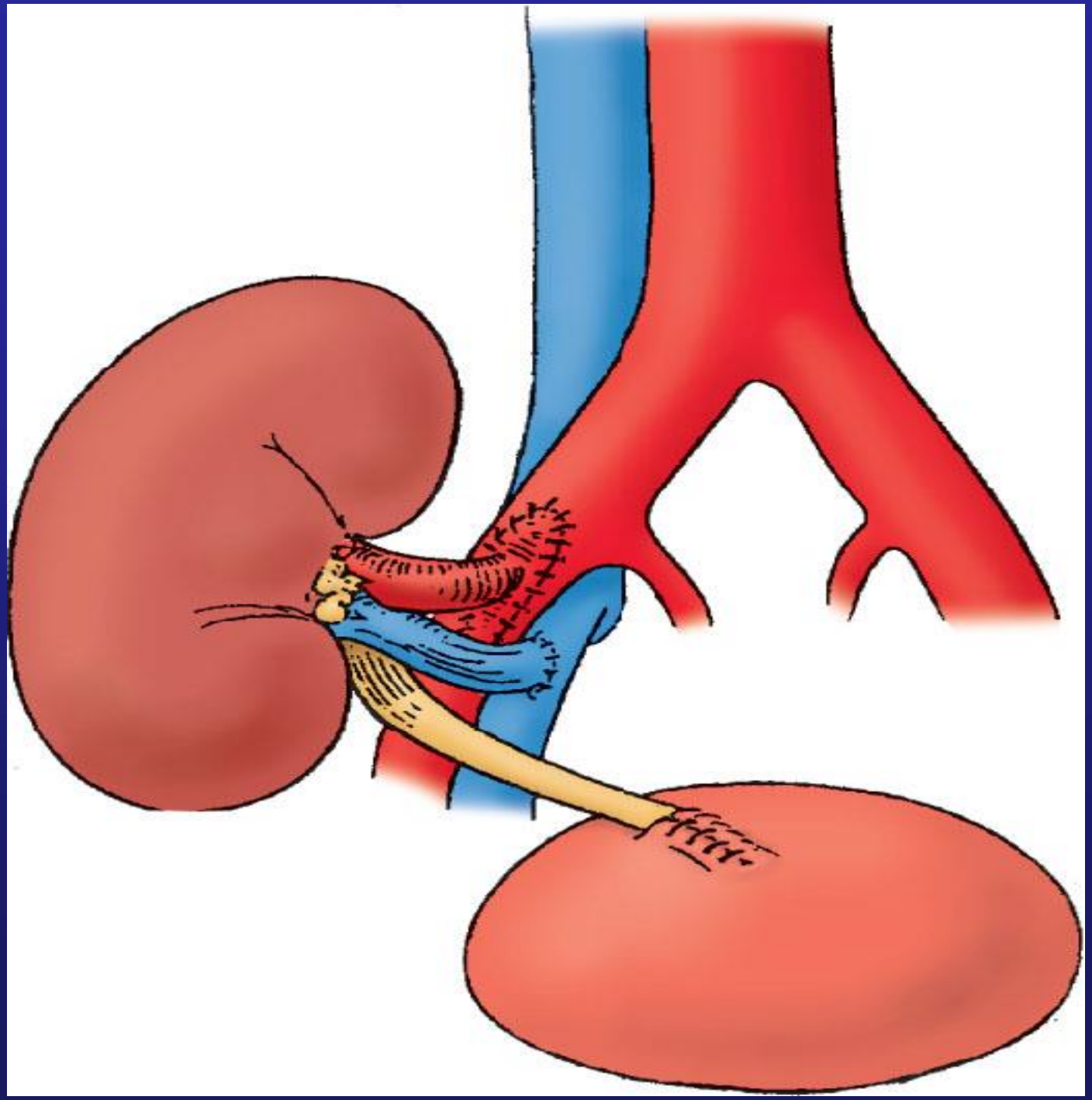
Kidney transplant procedure

- right iliac fossa
- * retroperitoneal access
- * exposure of external iliac vessels
- * renal vein to external iliac vein anastomosis
- * renal artery to external iliac artery anastomosis
- * ureter to bladder anastomosis



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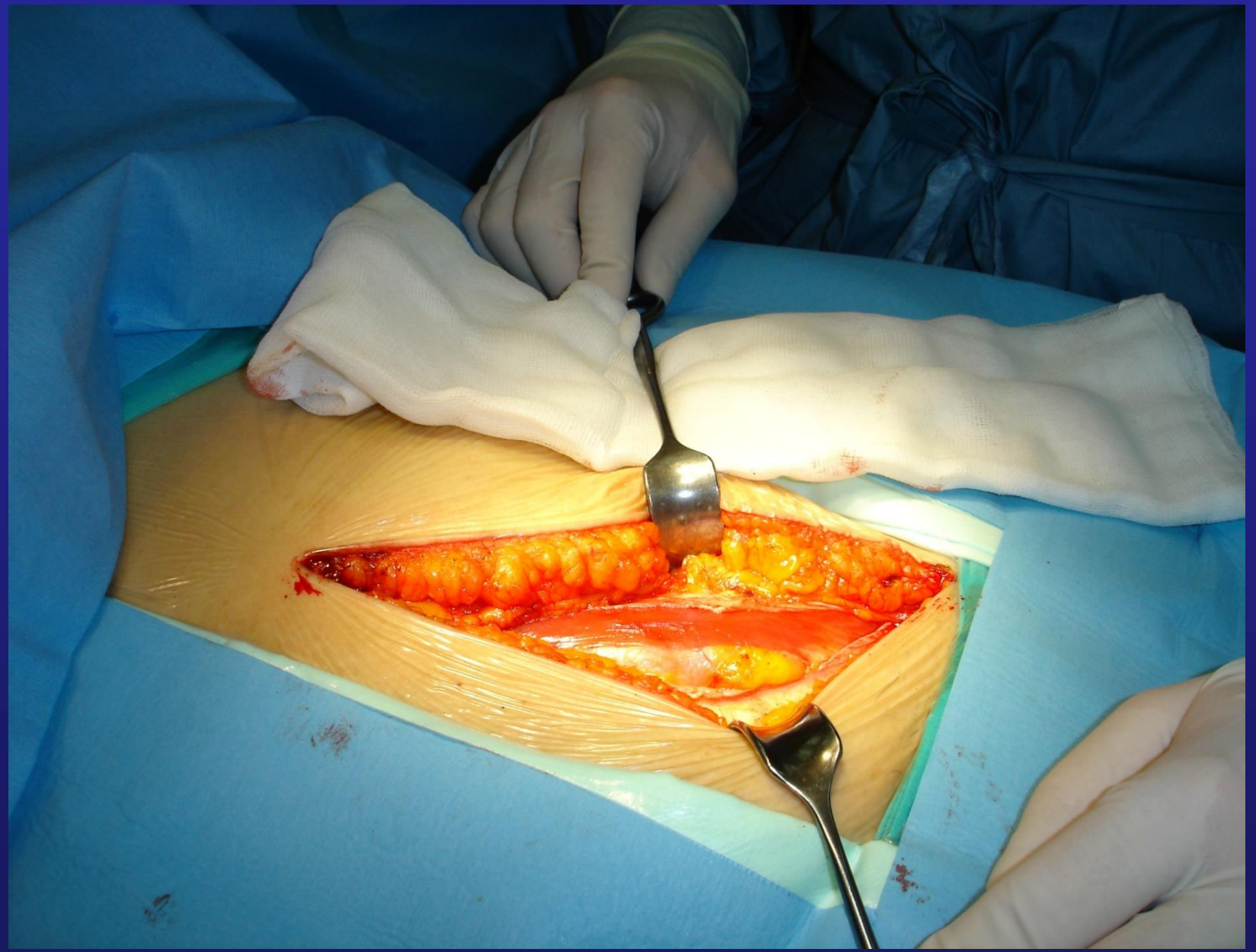

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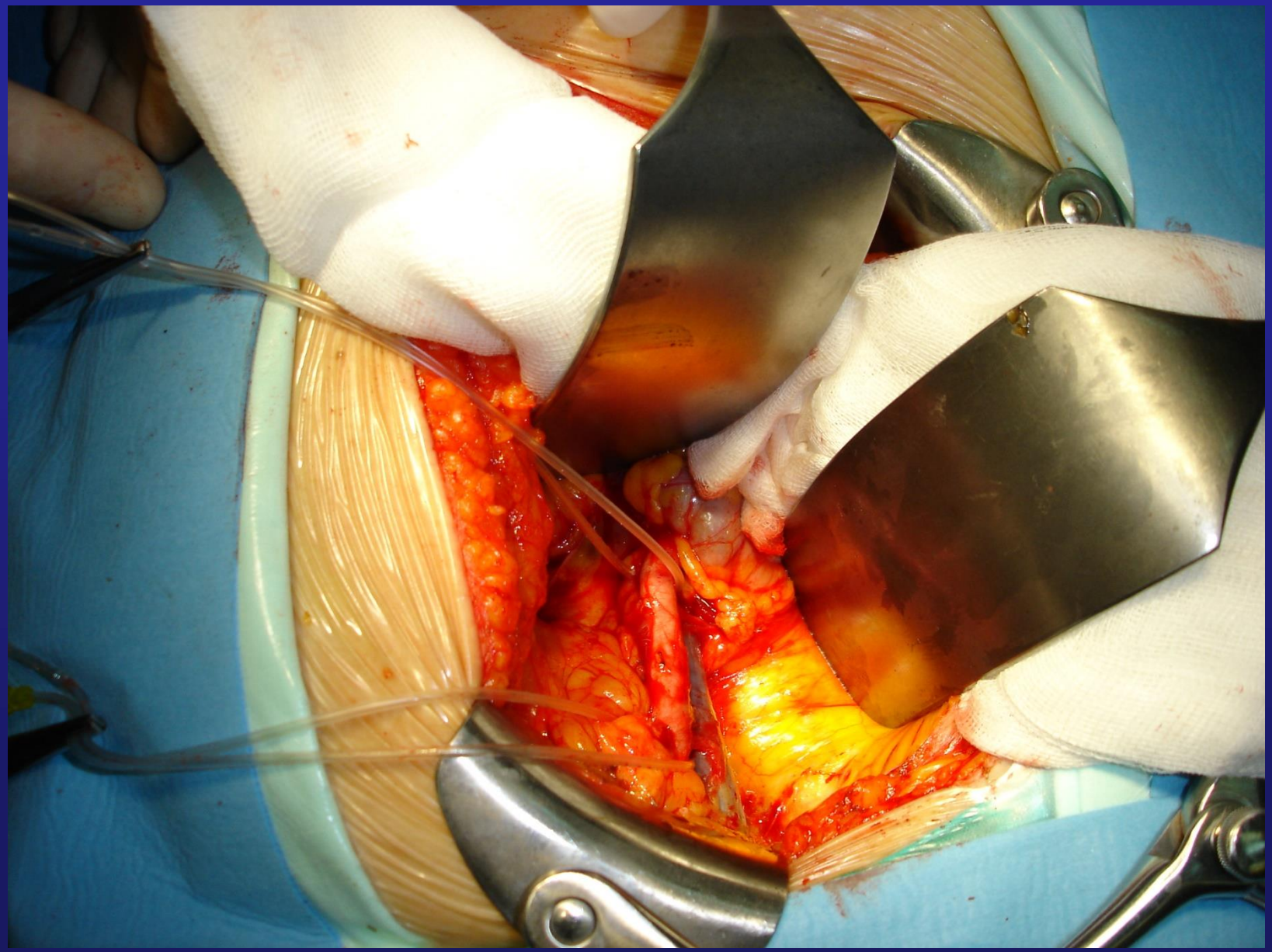

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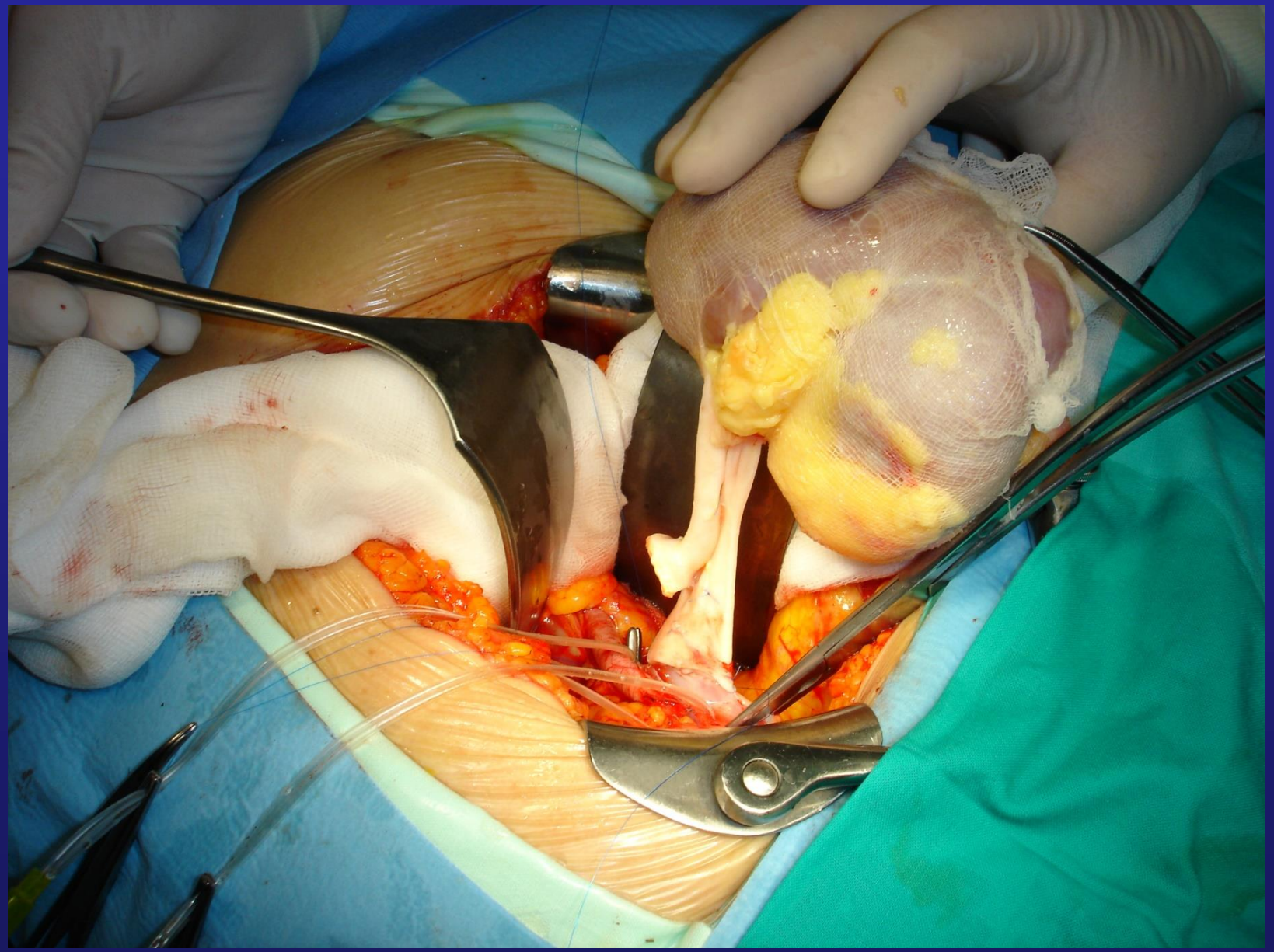

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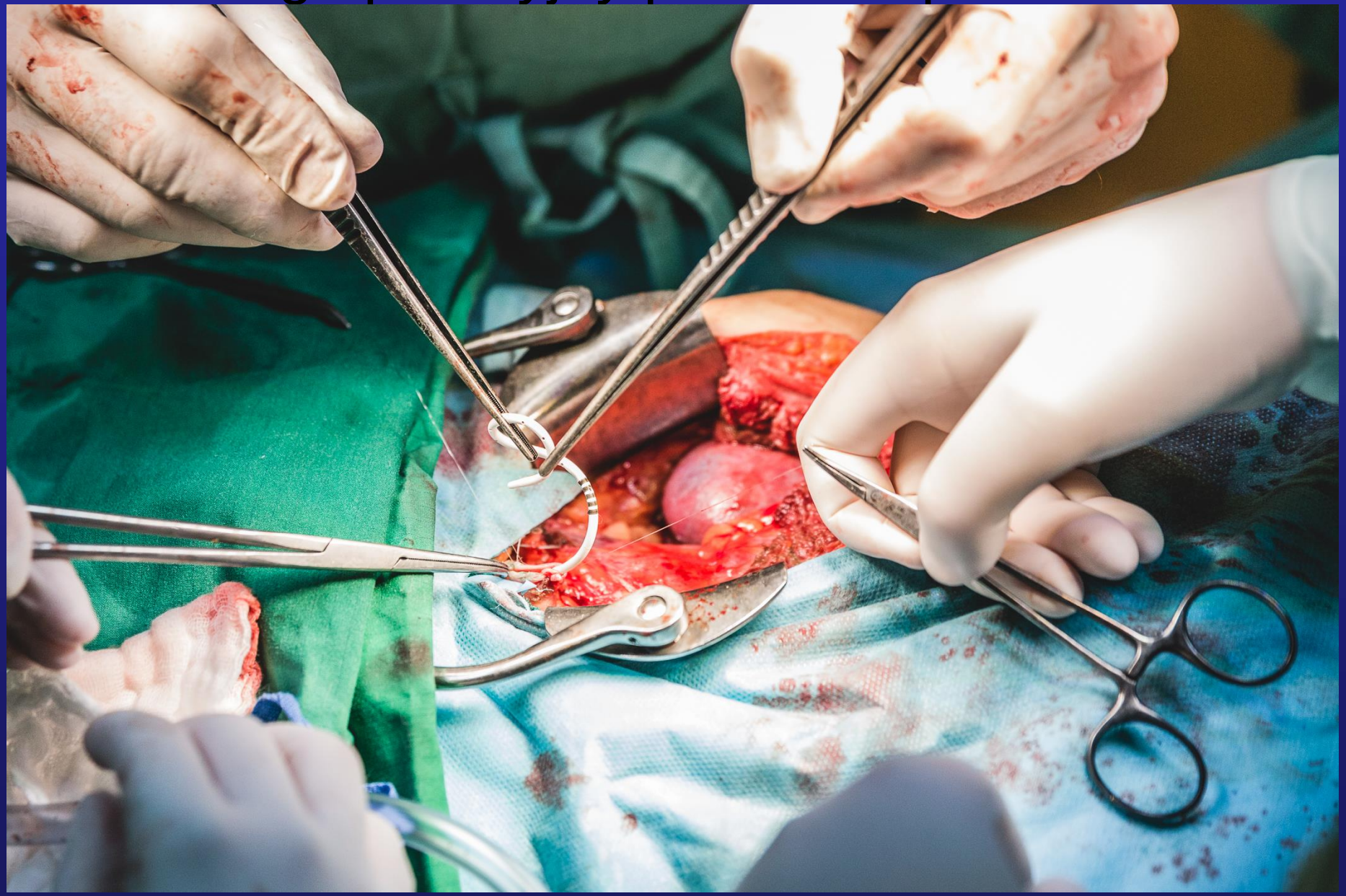
Zabieg operacyjny przeszczepienia nerki



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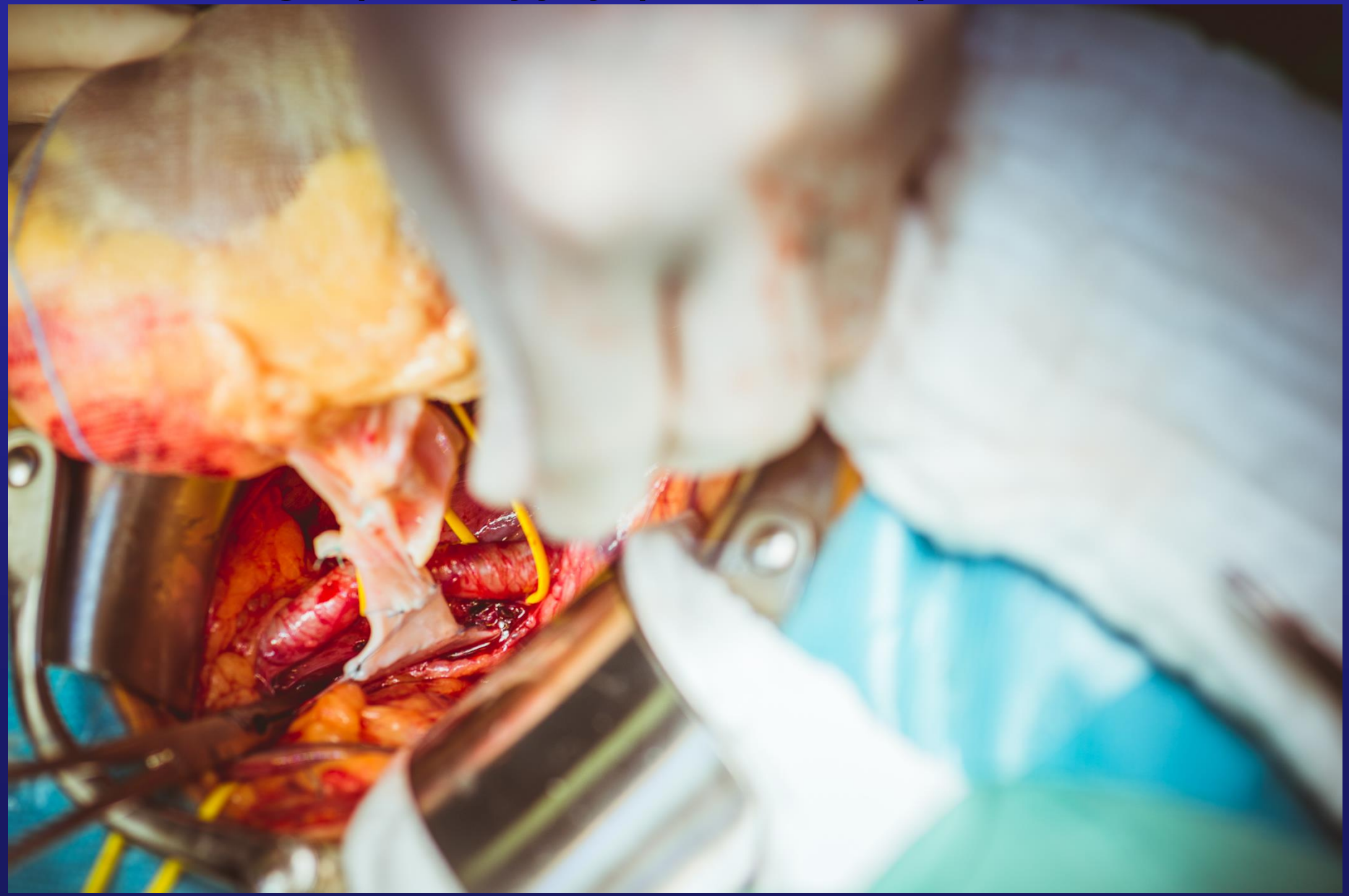
Zabieg operacyjny przeszczepienia nerki



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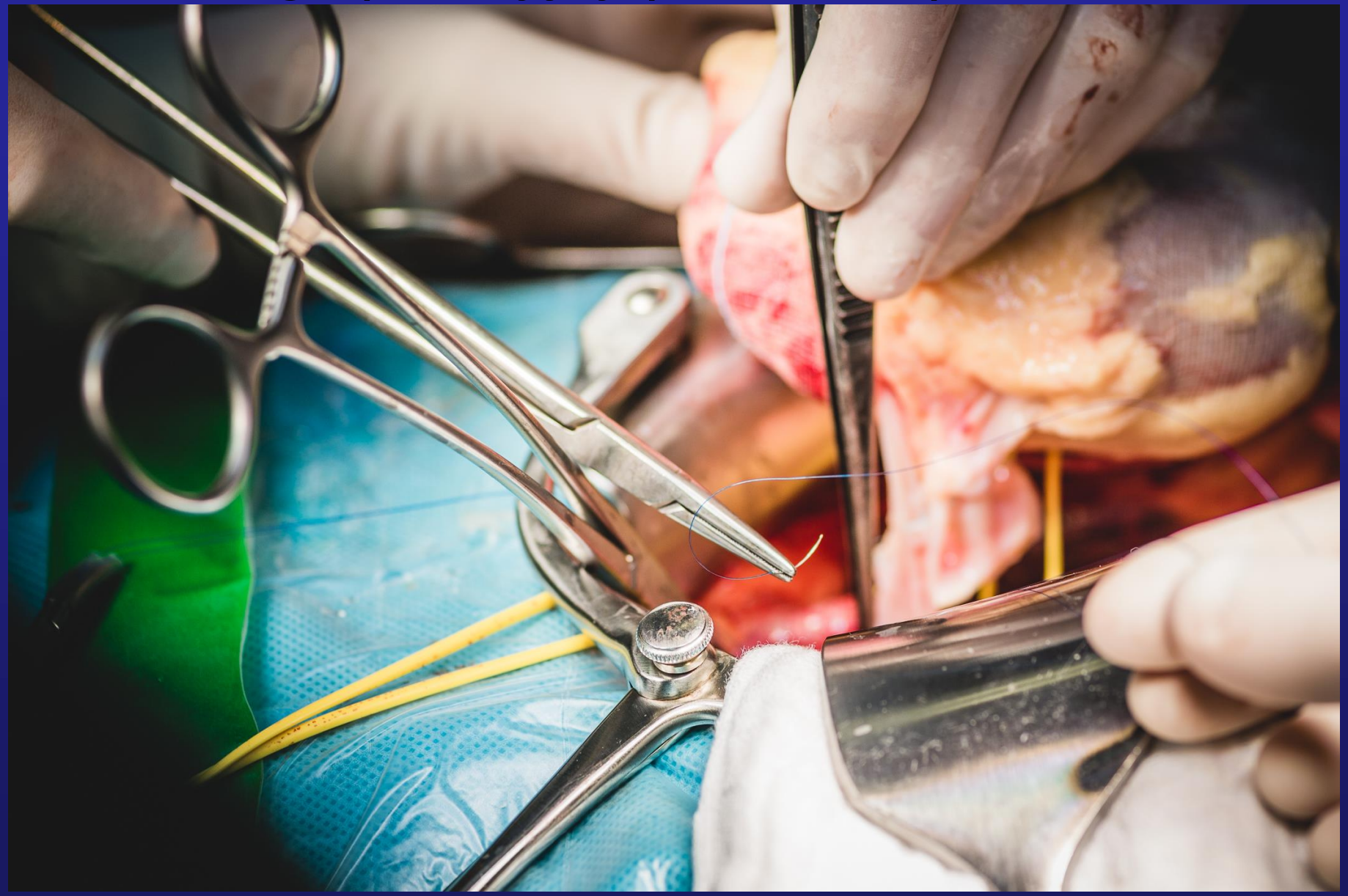
Zabieg operacyjny przeszczepienia nerki



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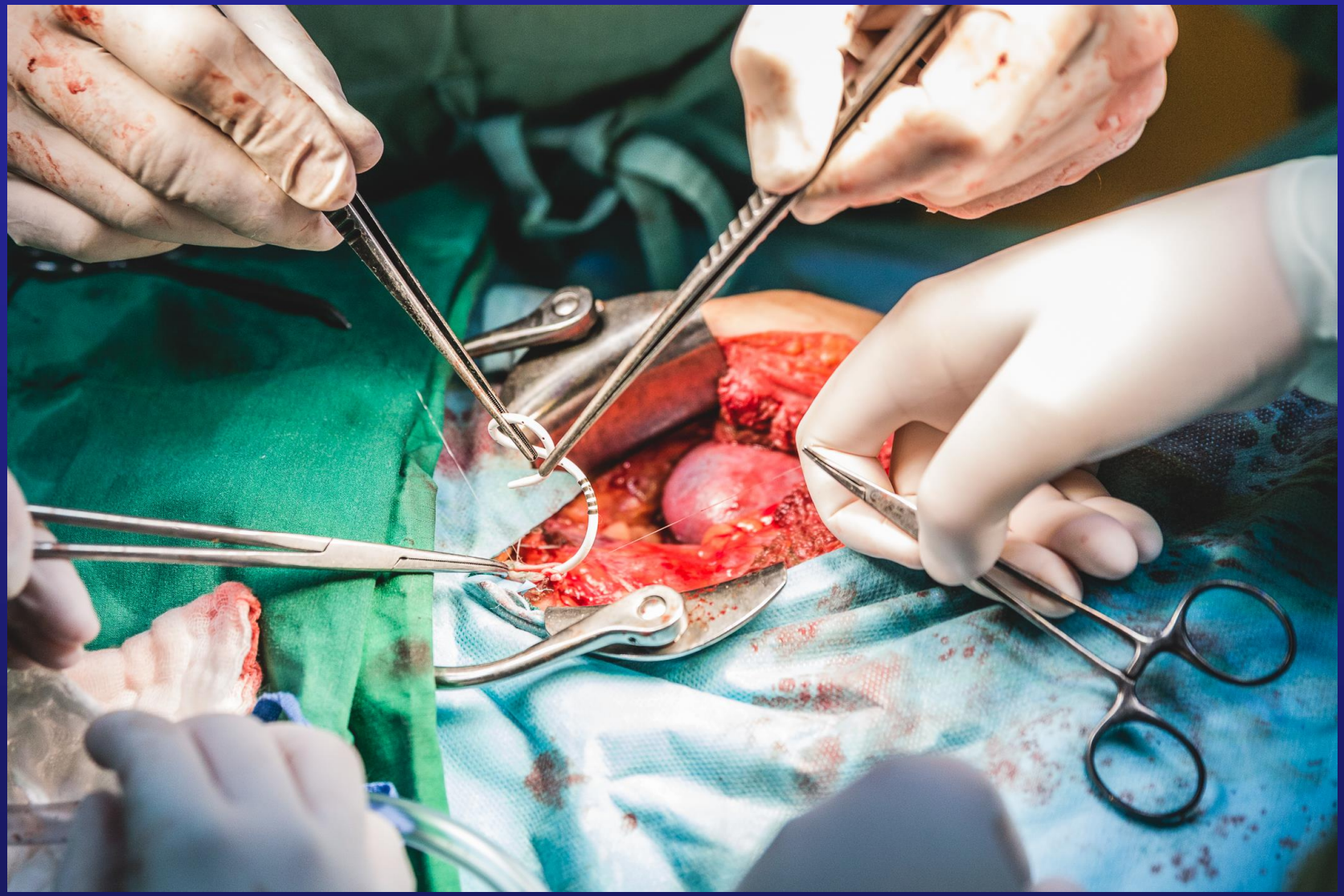

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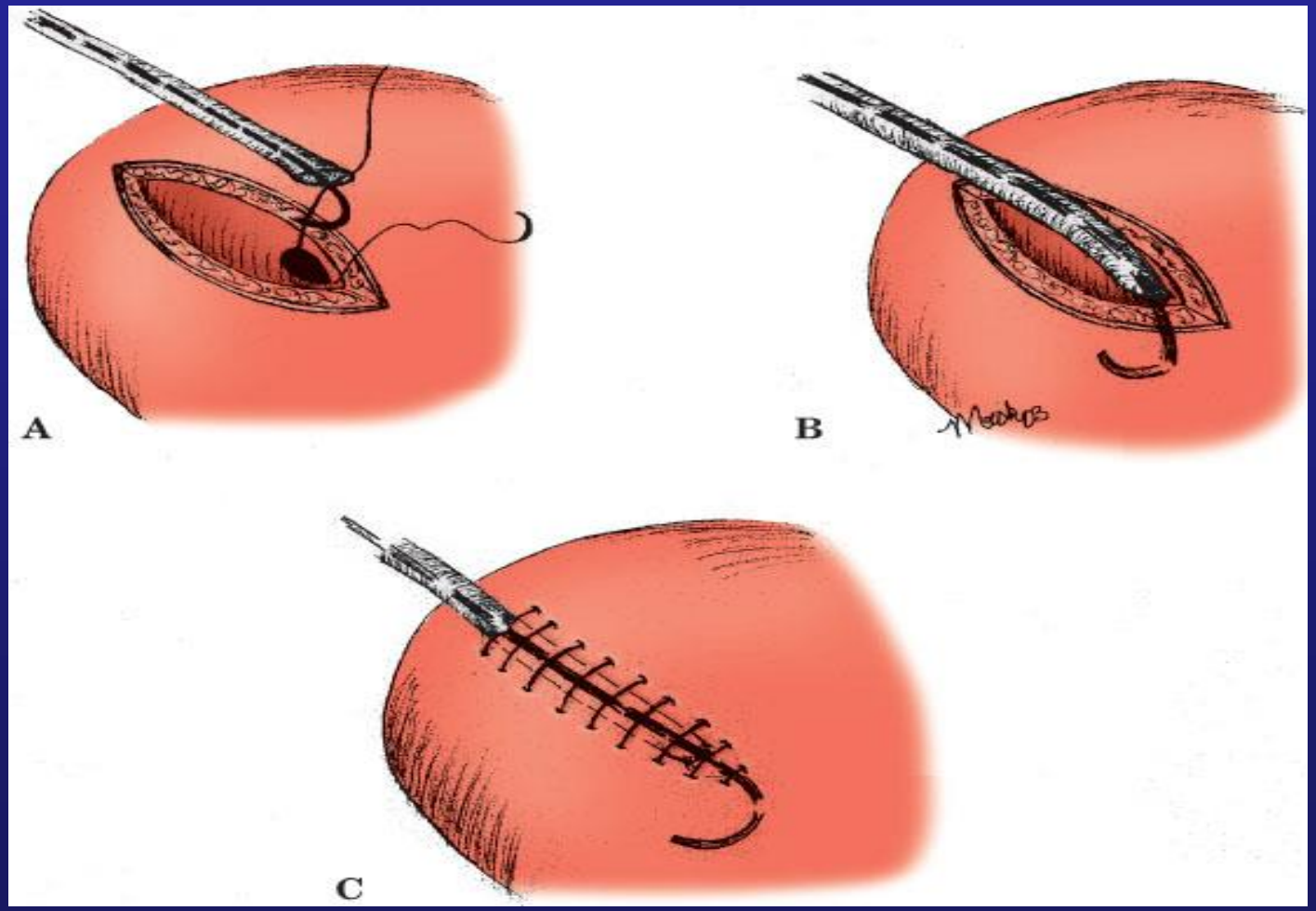
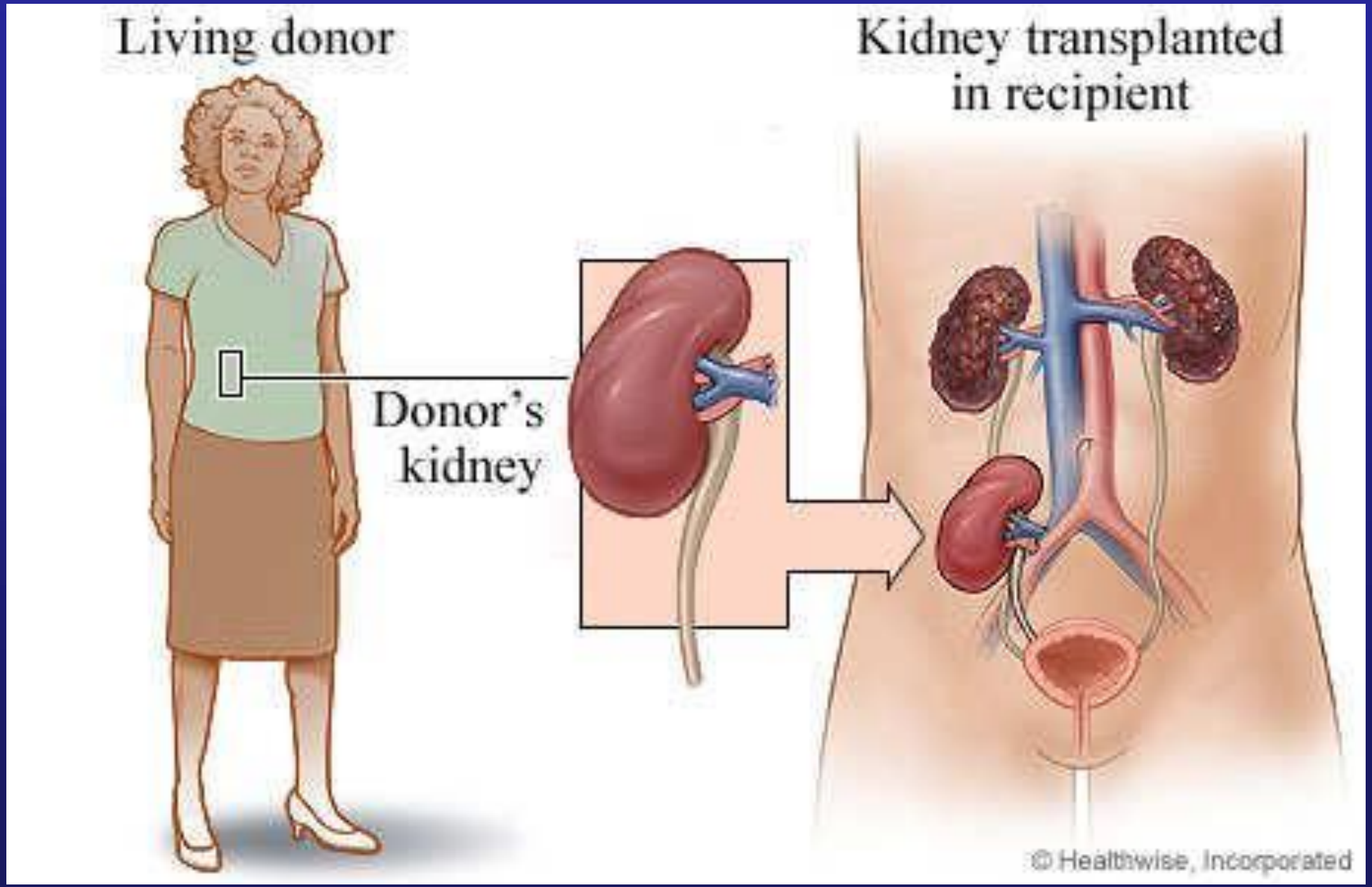
Ureter-bladder anastomosis




Living donor
Kidney transplanted in recipient
Donor's kidney
© Healthwise, Incorporated

Surgical complications after kidney transplantation

Early

anastomotic bleeding,

perirenal hematoma,

renal vessel thrombosis,

ureteral necrosis,

ureteral anastomotic separation,

renal pole necrosis,

renal vessel kinking,

wound infection,

Distant

arterial anastomotic stenosis,

renal artery stenosis,

ureteral anastomotic stenosis,

renal transplant tumor

renal transplant reflux

Enlargement of the pelvis of the transplanted kidney

Thank you for your attention