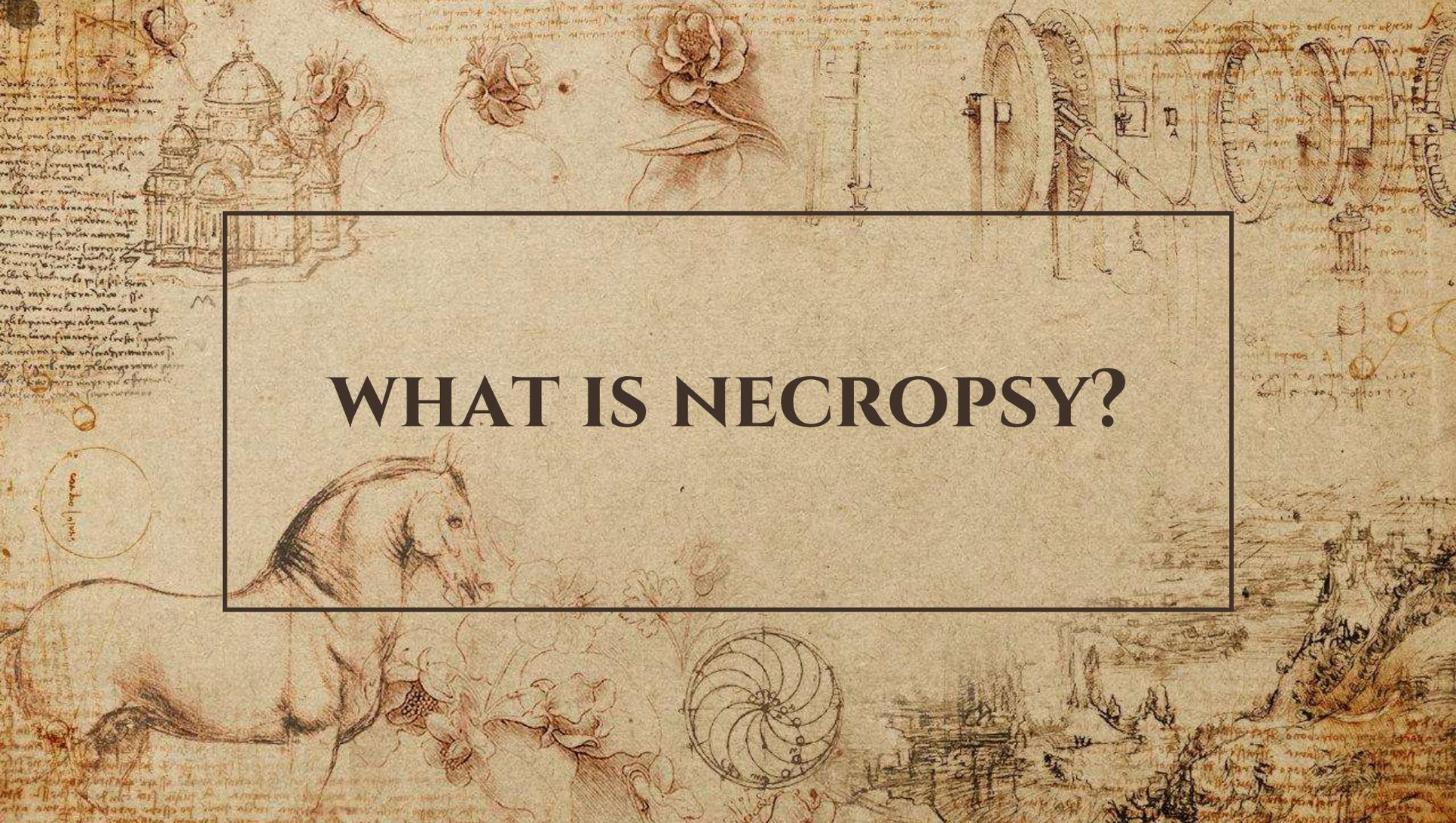


# NECROPSY

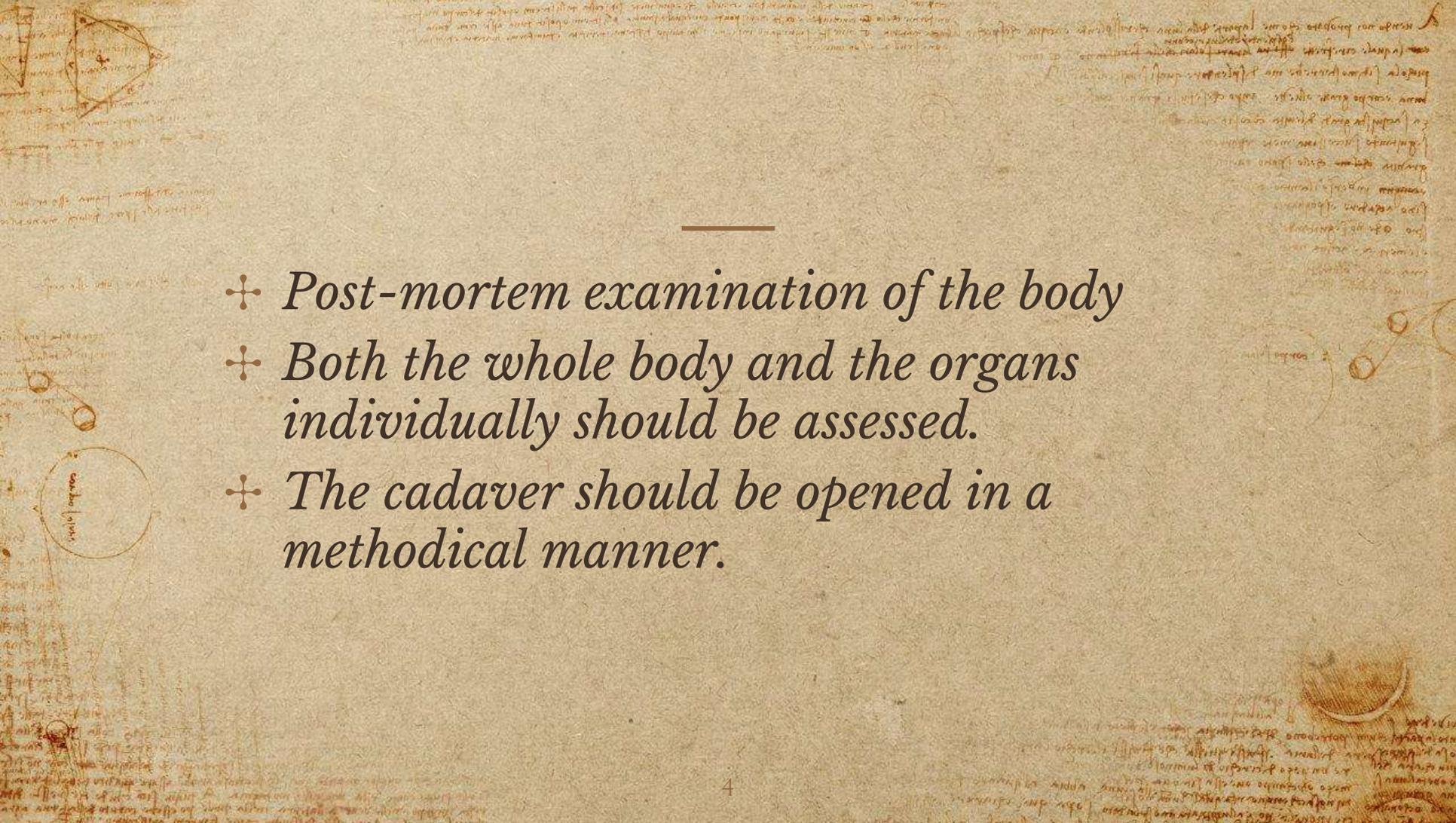
RES. ASSIST. DR. O. BURÇİN DEMİRTAŞ

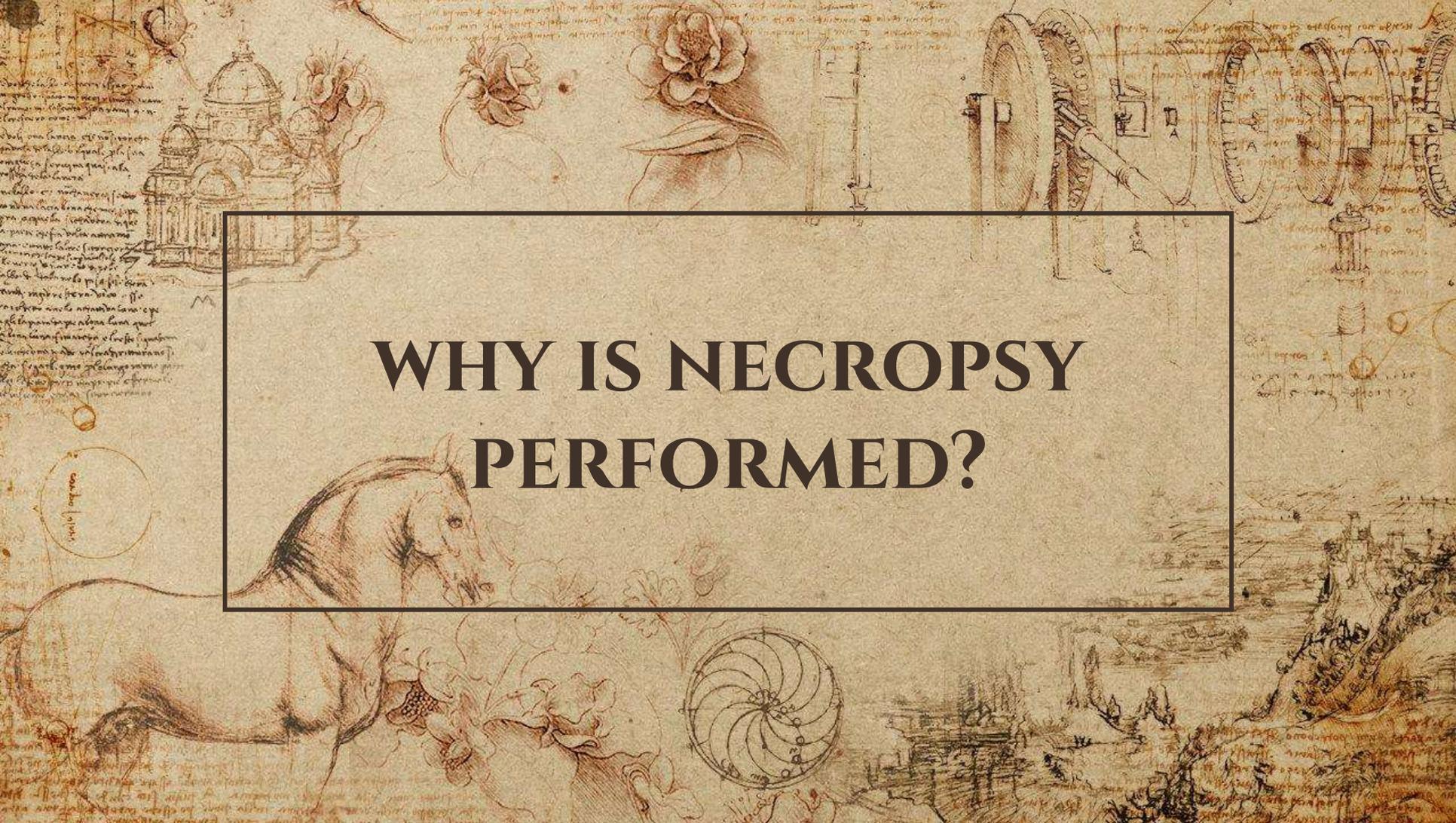


# WHAT IS NECROPSY?

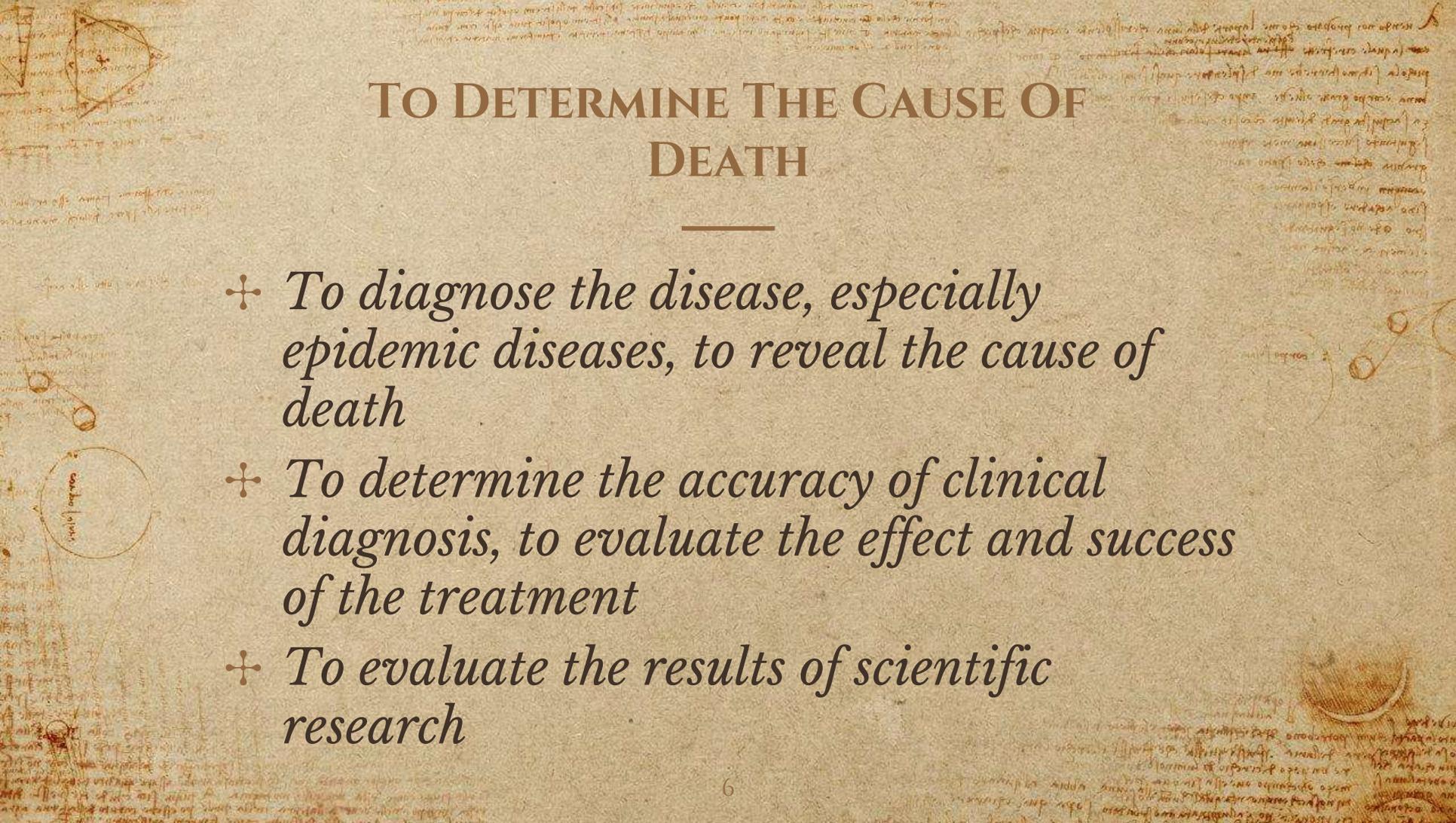


*Necropsy = Necro + opsie*  
*Autopsy = Auto + opsie*

- 
- ✦ *Post-mortem examination of the body*
  - ✦ *Both the whole body and the organs individually should be assessed.*
  - ✦ *The cadaver should be opened in a methodical manner.*



# WHY IS NECROPSY PERFORMED?



# TO DETERMINE THE CAUSE OF DEATH

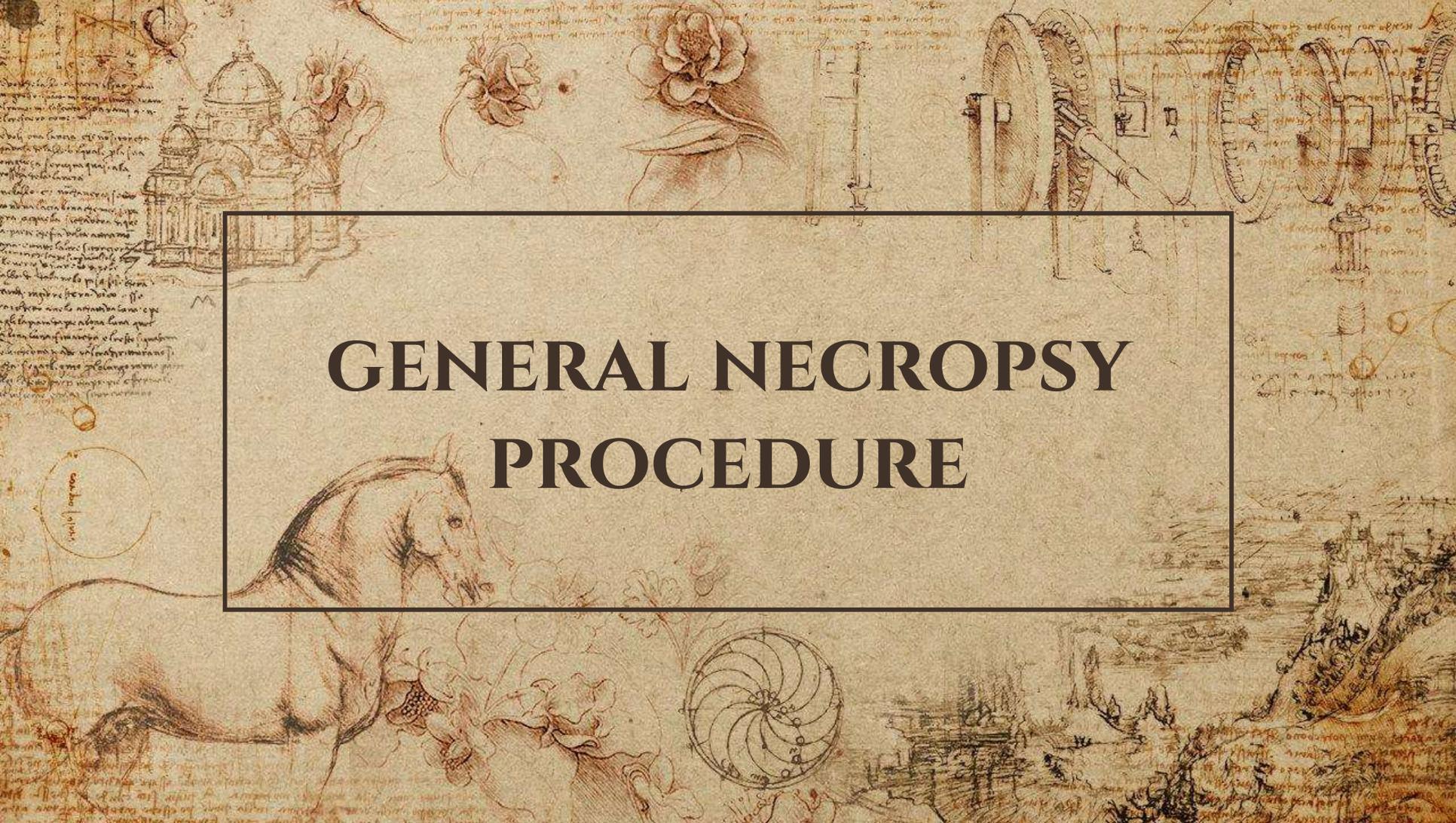
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- ✦ *To diagnose the disease, especially epidemic diseases, to reveal the cause of death*
- ✦ *To determine the accuracy of clinical diagnosis, to evaluate the effect and success of the treatment*
- ✦ *To evaluate the results of scientific research*

# TO DETERMINE THE CAUSE OF DEATH

---

- ✦ *To check the structure and course (pathogenesis) of the disease*
- ✦ *Report to the insurance if the animal has died from the disease covered by insurance*
- ✦ *To report to the court in forensic cases*



# GENERAL NECROPSY PROCEDURE

# HOW TO START?

---

- ✦ *Location*
- ✦ *Selecting tools*
- ✦ *Deciding position*
- ✦ *External examination*
- ✦ *Internal examination*
- ✦ *Size*
- ✦ *Anatomical structure*
- ✦ *Purpose of necropsy*

# FOR EVERY NECROPSY...

---

- ✦ *Finish the external examination*
- ✦ *Decide which organ to focus on more*
- ✦ *Choose the proper method, tools, and place*
  
- ✦ *Start with taking measurements*

# FOR EVERY NECROPSY...

*External  
Examination*

1

*Opening  
body cavities*

3

*Decapitating*

5

*Examination of the  
internal organs,  
bones, muscles, joints*

7

*Skining and  
detaching  
extremities*

2

*Removing  
organs of the  
neck*

4

*Opening  
M. spinalis*

6

# NECROPSY POSITION

---

## Ventro-dorsal

- ✦ *To work on two sides of the cadaver.*
- ✦ *Prevents contamination and leakage of contents when body cavities are opened.*
- ✦ *Small animals or younglings*

## Latero-lateral

- ✦ *Where work area is narrow.*
- ✦ *Suitable for single-sided studies with a single person.*
- ✦ *Adult Ruminants and Equidae*

# EXTERNAL EXAMINATION

## *General Examination*

- ✦ *Animal information*
- ✦ *Owner information*
- ✦ *Anamnesis*
- ✦ *General appearance*
- ✦ *Body condition*
- ✦ *Position at the time of death*
- ✦ *Time of death and postmortal changes*

## *Detailed Examination*

- ✦ *Skin & fur*
- ✦ *Orifices & external mucosae*

# INTERNAL EXAMINATION

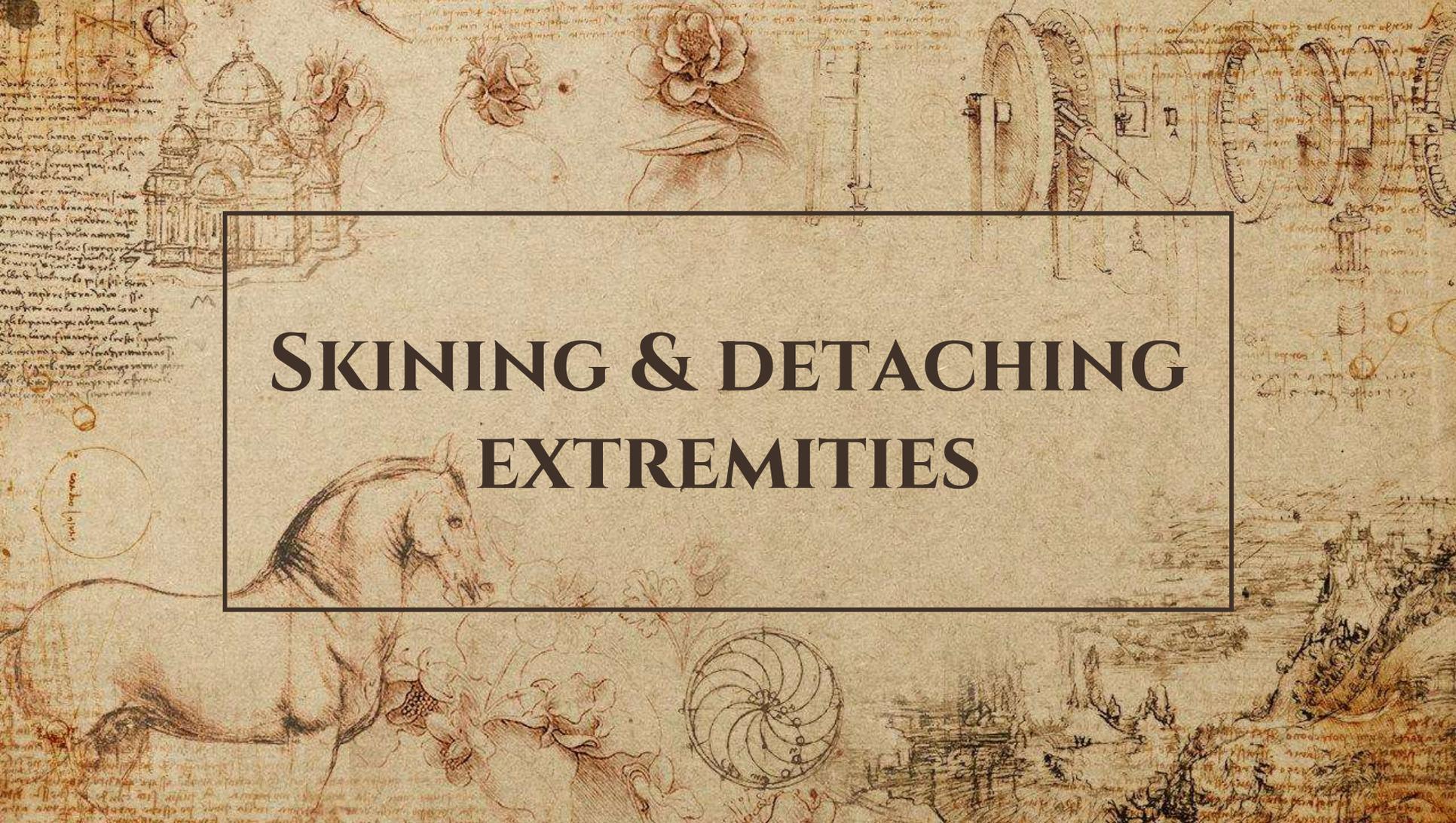
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## Methodical (Virchow)

*It is based on the removal of organs which are related anatomically and functionally*

## Holoptical (Rokitansky)

*It is based on the examination of the organs within a system*



**SKINNING & DETACHING  
EXTREMITIES**

## VENTRO-DORSAL

---

- ✦ *Make a transversal cut on the symphysis mandible*
- ✦ *Start there and follow the midline through symphysis pelvis*
- ✦ *Go around the external genitalia and the umbilical cord*
- ✦ *Cut in between the mammae in dogs, pigs, etc*

## LATERO-LATERAL

- ✦ *Make a transversal cut at the end of sternum*
- ✦ *Start there and follow the midline through symphysis pelvis and symphysis mandible*
- ✦ *Go around the external genitalia and the umbilical cord*
- ✦ *Cut in between the mammae in dogs, pigs, etc*

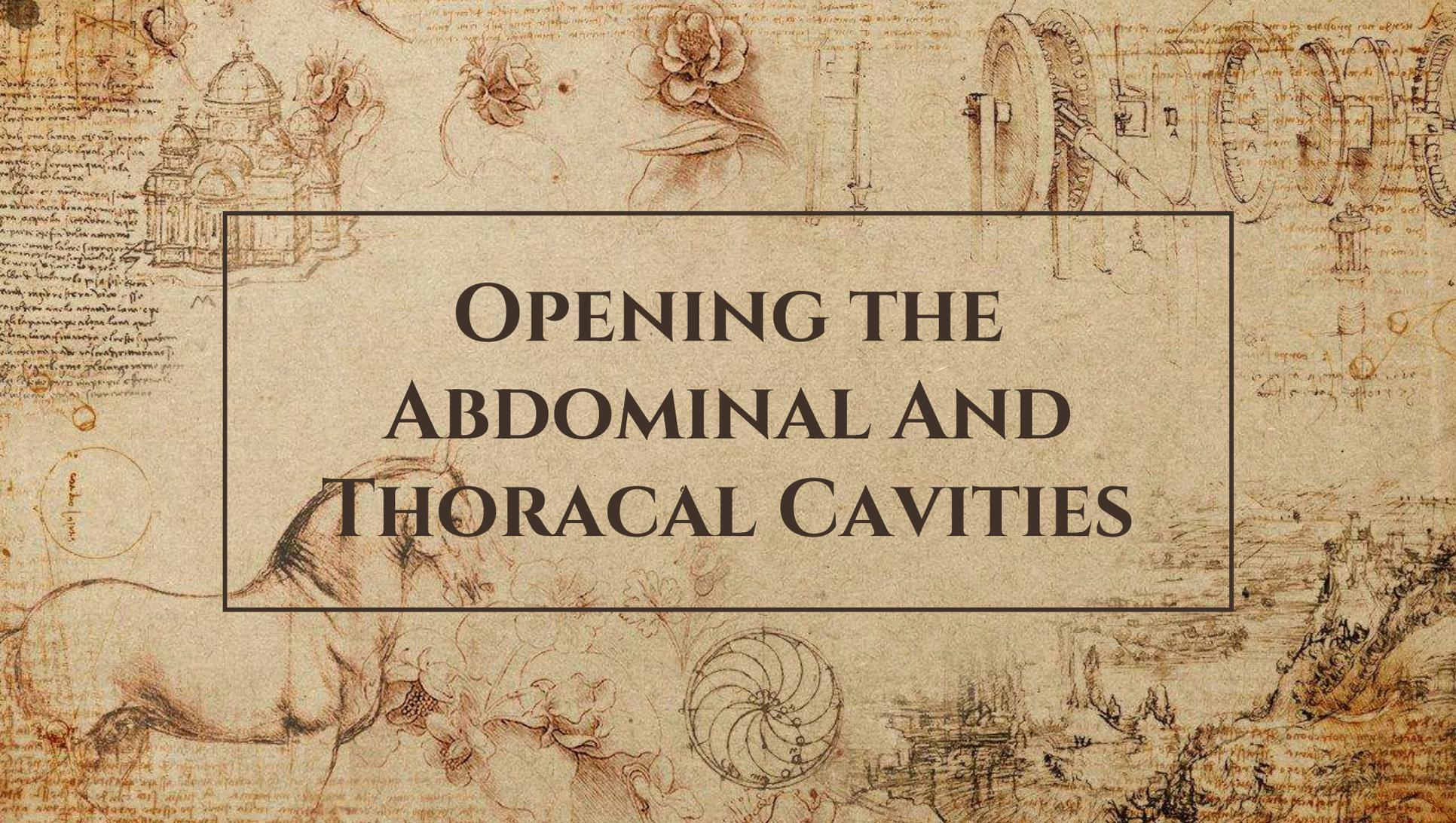
## IF THE SKIN HAS VALUE..

---

- ✦ *Make additional circular cuts on the carpal/tarsal joints*
- ✦ *Make additional linear cuts that connect these to the mid-line*
- ✦ *Ears should be left on the removed skin*
- ✦ *Some skin should be left around the eyes, mouth and nose, and on the tail.*

# DETACHING EXTREMITIES

- ✦ *Widen the first incision on the mid-line around the neck, thorax, and abdomen.*
- ✦ *Pull the front limb(s) away from the cadaver and cut starting from the mid-line to the muscles beneath scapula.*
- ✦ *Pull the hind limb(s) away from the cadaver and cut the muscles on the median of the femur and expose the coxo-femoral joint.*
- ✦ *Dislocate the coxo-femoral joint.*

The background of the image is a collage of Leonardo da Vinci's anatomical sketches. On the left, there is a drawing of a dome-shaped building. In the center, there are several detailed drawings of flowers. On the right, there are mechanical diagrams of gears and wheels. At the bottom, there is a drawing of a horse's head and neck, and a circular diagram with spiral lines. The sketches are rendered in brown ink on aged, yellowish paper.

# OPENING THE ABDOMINAL AND THORACAL CAVITIES

# OPENING THE ABDOMINAL AND THORACAL CAVITIES

## Seperately

*Preferred when there is liquid such as transudate, exudate and blood, also if the animal is pregnant, a neoplastic formation is detected, and if the suspected disease is confined to one of the cavities.*

## Together

*Prefered when the animal is not pregnant, there is no accumulation of exudate, the lesions/the suspected disease is seen in both cavities.*

# SEPERATELY ABDOMEN-VENTRODORSAL

---

- ✦ *Find Cartilago Xiphoidea*
- ✦ *Make a 4-5 cm long, transversal insicion behind it, on the abdominal wall*
- ✦ *Check for any abnormality*
- ✦ *Insert two fingers through the first insicion, then make a second insicion following the median line (linea alba), guided by your fingers*
- ✦ *Go back to the first insicion, widen it from both sides symettrically following the last costae.*

# SEPERATELY ABDOMEN-LATERAL

- ✦ *Find Cartilago Xiphoidea*
- ✦ *Make a 4-5 cm long, transversal insicion behind it, on the abdominal wall*
- ✦ *Check for any abnormality*
- ✦ *Insert two fingers through the first insicion, then make a second insicion following the median line (linea alba), guided by your fingers*

✦ *Go back to the first insicion, widen it from the upper side of the animal*

# SEPERATELY THORAX-VENTRODORSAL

---

- ✦ *Find the part of the diaphragm closest to the sternum (dome)*
- ✦ *Make 2-3 cm long transversal incision*
- ✦ *Check for any abnormality*
- ✦ *Widen the first incision from both sides symetrically following the last costae*
- ✦ *Reach inside the thoracal cavity, find the ligaments between the pericardium and the sternum, remove them bluntly.*

## SEPERATELY THORAX-VENTRODORSAL

---

**A**

*The costae are usually opened with a costatome, as close to the columna vertebralis as possible.*

**B**

*In small-sized animals, the costachondral junctions can be cut with a knife.*

*In younglings, the sternum can be lifted up and the costal cartilage can be cut horizontally, close to the sternum.*

**C**

*In younglings, the sternum is not completely hardened, so it can be cut in the middle.*

## SEPERATELY THORAX-LATERAL

- ✦ Find the part of the diaphragm closest to the sternum (dome)
- ✦ Make 2-3 cm long transversal insicion
- ✦ Check for any abnormality
- ✦ Widen the first insicion through the upper side, and remove the connections bluntly between the pericardium and sternum.

# SEPERATELY THORAX-LATERAL

---

✦ *Cut the costae both from the closest part to the columna vertebralis and sternum, and lift the overlying half of the ribcage.*

# TOGETHER

---

- ✦ *The same incisions are made.*
- ✦ *The organs of the abdominal cavity are not taken out until the thoracal cavity is also exposed.*

## EXTRA METHODS (I)

- ✦ *Inguinal hernia, improper castration, infarct, etc.*
- ✦ *The tongue and cervical organs are seperated until A. Thoracis cranialis.*
- ✦ *The overlying abdominal wall is cut following the costal arch from the c.vertebralis to the sternum, then, midline is followed up until the upper inguinal region.*

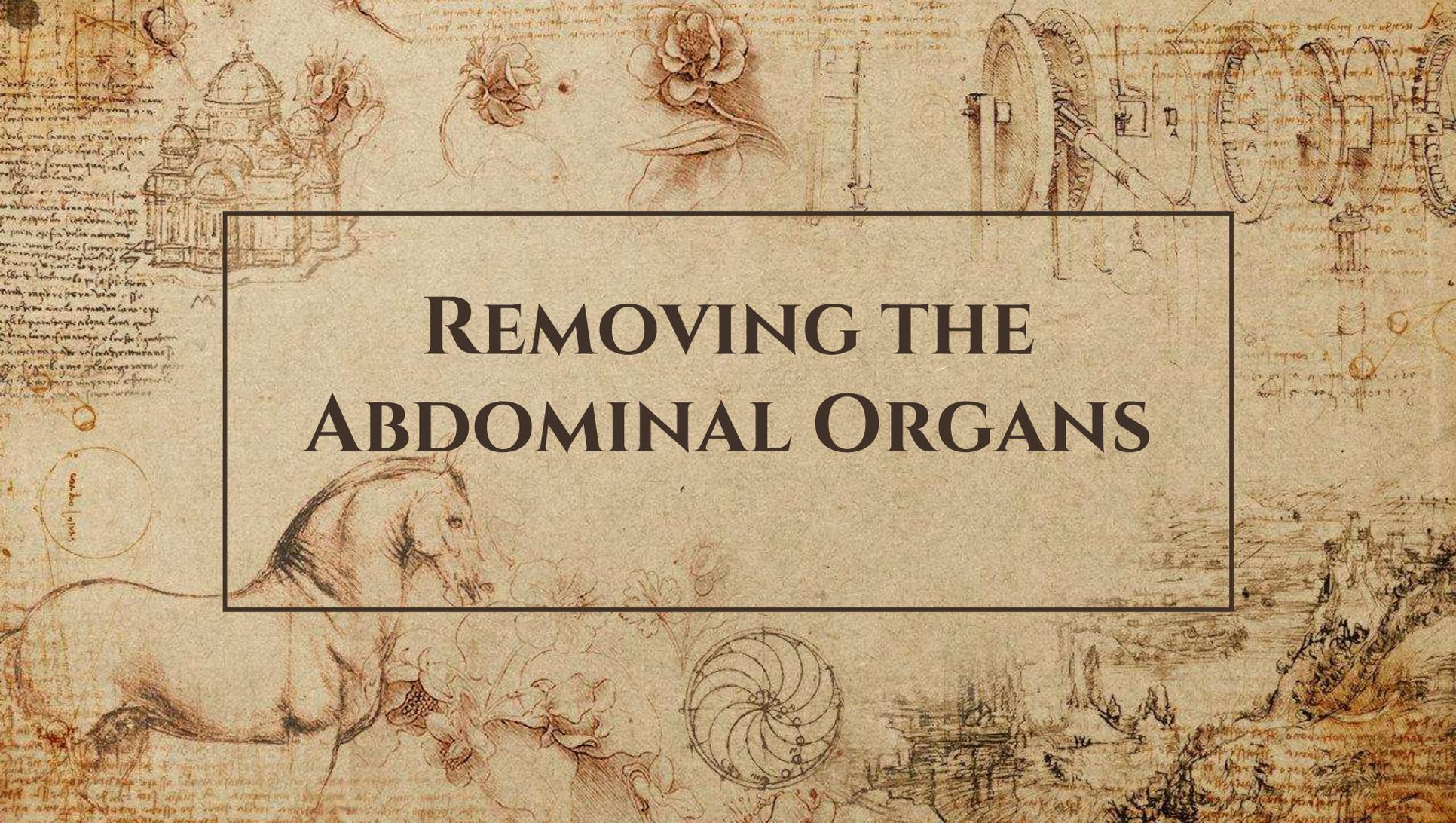
## EXTRA METHODS (I)

---

✦ *Then the thorax is opened unilaterally, starting from A. Thoracis cranialis, from both ends of the costae (columna vertebralis, and sternum)*

## EXTRA METHODS (2)

- ✦ *Esp. in large animals, where it is harder to open the ribcage due to the size of the bones and/or lack of the necessary equipment (saw, costatome, etc.)*
- ✦ *The abdominal cavity is opened first, and followed by cutting the diaphragm and removing the connections between the pericardium and the sternum.*
- ✦ *After separating the cervical organs, the ribcage is not opened.*
- ✦ *Instead, a circular cut is made reaching in through the A. Thoracis cranialis.*

The background of the image is a collage of Leonardo da Vinci's anatomical sketches. It includes a detailed drawing of a horse's head and neck, a large architectural dome, a complex mechanical gear system, a spiral diagram, and various other anatomical and mechanical drawings. The sketches are rendered in brown ink on aged, yellowish paper. A central black-bordered box contains the text.

# REMOVING THE ABDOMINAL ORGANS

# REMOVING ABDOMINAL ORGANS -DOG & CAT-

---

- ✦ *The first encountered organ is the omentum*
- ✦ *Take the omentum and spleen out, seperating bluntly from the connections with the stomach and pancreas*

# REMOVING ABDOMINAL ORGANS -DOG & CAT-

- ✦ *You can either take the intestines out together, or seperately by seperating from the mesenterium*
- ✦ *Find the caecum, and the ileocecal junction*
- ✦ *Put two knots on the end of ileum*
- ✦ *Cut the ileum in between and follow the ileum up to jejenum and end of the duodenum, while seperating from the mesenterium*
- ✦ *Pass the ligamentum duodenocolicum and stop where you reach the pancreas*
- ✦ *Put two knots on the last 1/3 of duodenum and cut in between*

# REMOVING ABDOMINAL ORGANS -DOG & CAT-

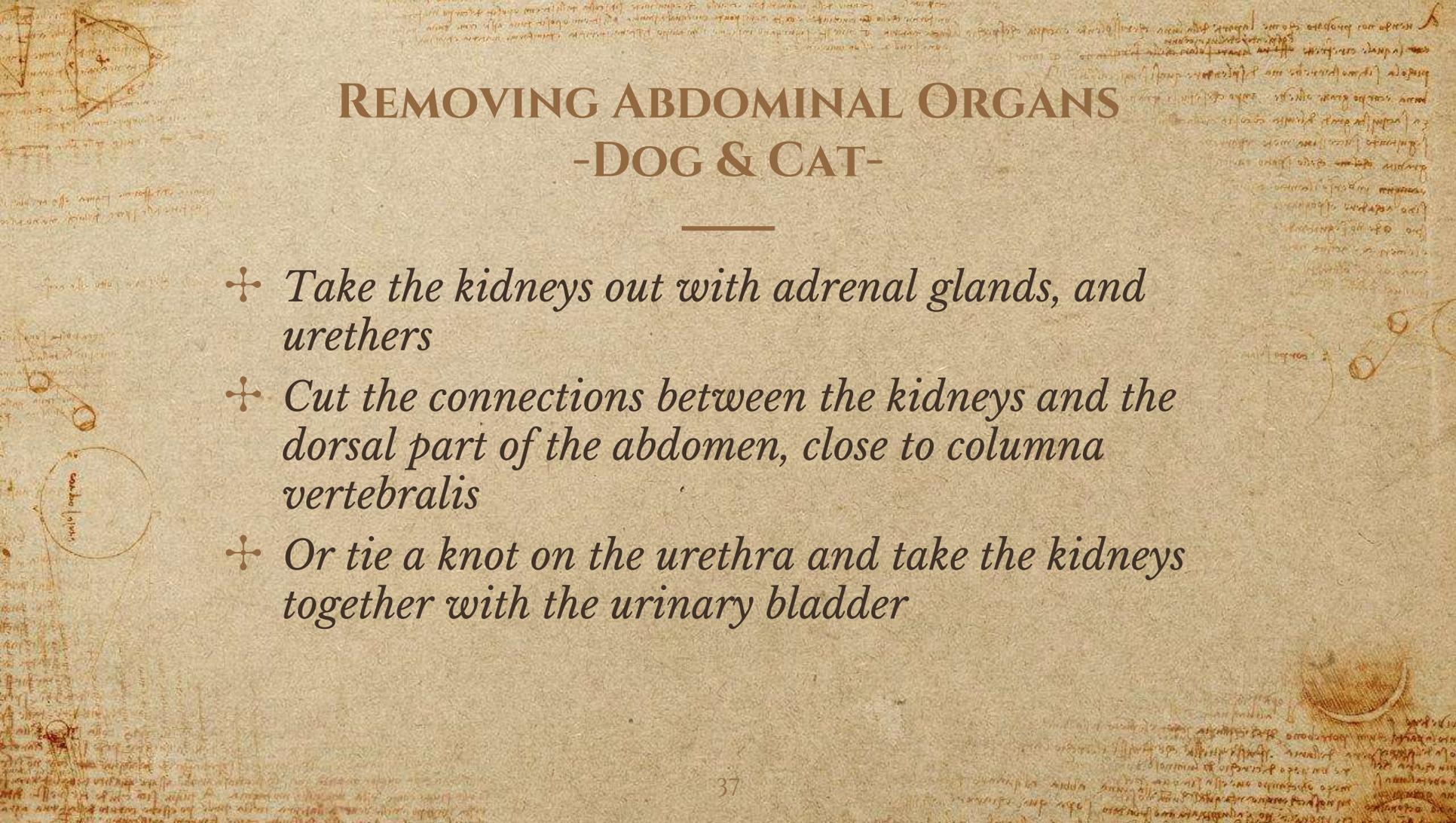
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- ✦ *To take out the large intestines, tie two knots on the rectum, as close to anus as possible*
- ✦ *Cut in between those ties and take the large intestines out by cutting the connections*
- ✦ *Take out the caecum, colon, rectum and mesenterial lymph nodes*

# REMOVING ABDOMINAL ORGANS -DOG & CAT-

---

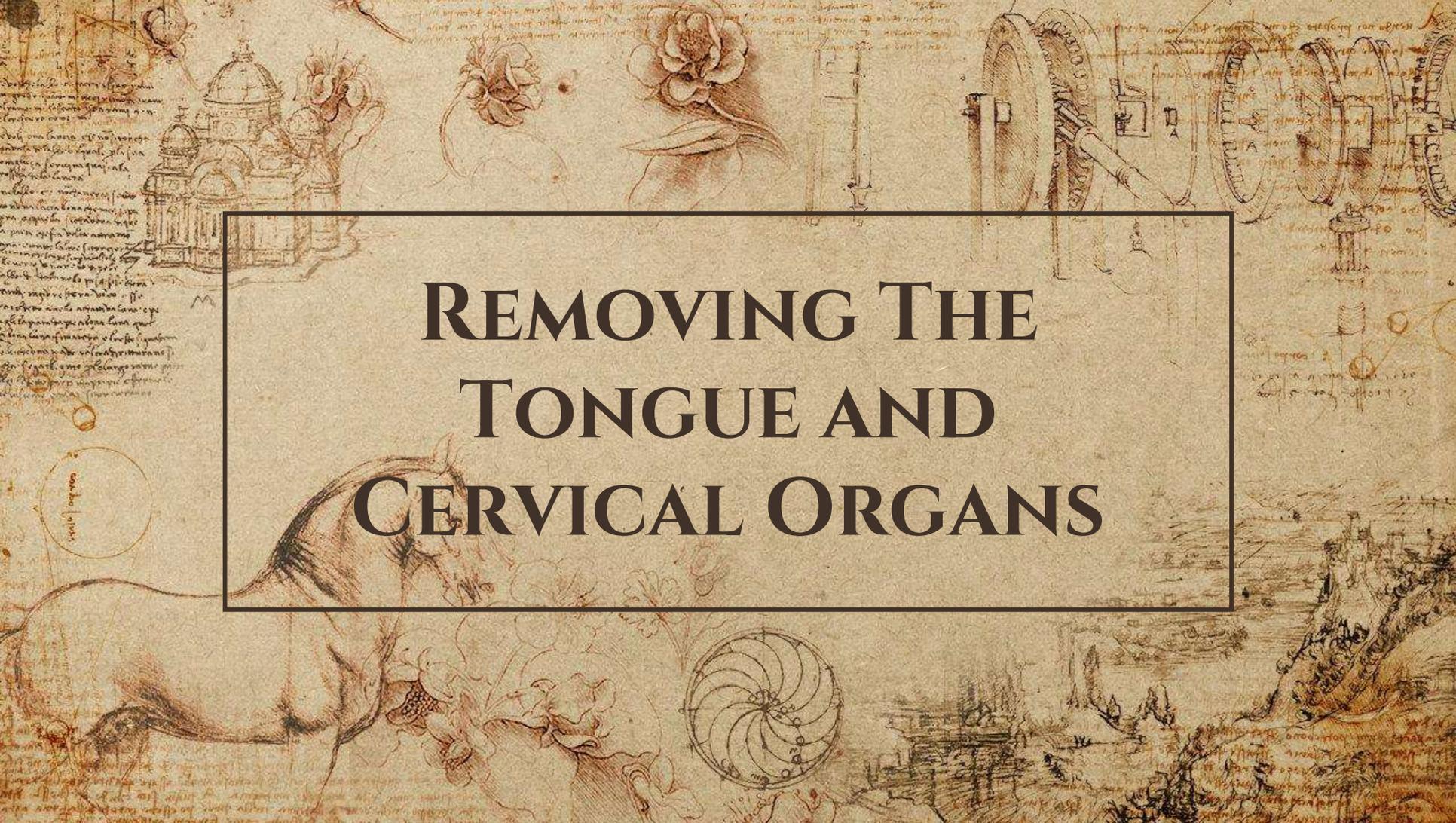
- ✦ *Find the end of esophagus on the left side of the abdominal cavity and tie two knots*
- ✦ *Cut in between, then hold the liver and stomach in your hand and cut the connections between the liver and diaphragm*
- ✦ *Take out the stomach, duodenum, liver, and pancreas out together*



# REMOVING ABDOMINAL ORGANS -DOG & CAT-

---

- ✦ *Take the kidneys out with adrenal glands, and urethers*
- ✦ *Cut the connections between the kidneys and the dorsal part of the abdomen, close to columna vertebralis*
- ✦ *Or tie a knot on the urethra and take the kidneys together with the urinary bladder*

The background of the image is a detailed reproduction of Leonardo da Vinci's anatomical sketches. It features various drawings including a horse's head in profile, a dome-shaped building, a large flower, a mechanical gear system, and a circular diagram with spiral lines. The sketches are rendered in brown ink on aged, yellowish paper. A central black-bordered box contains the title text.

# REMOVING THE TONGUE AND CERVICAL ORGANS

## IN LARGE ANIMALS

---

- ✦ *After widening the incision on the skin, cut the trachea and esophageus from the upper 1/3.*
- ✦ *Leave the upper part with the head, and make another small cut in between the cartilages on the caudal part of trachea.*
- ✦ *By inserting your fingers through this cut, pull the trachea caudally, cutting the connections and muscles simultaneously.*

## IN LARGE ANIMALS

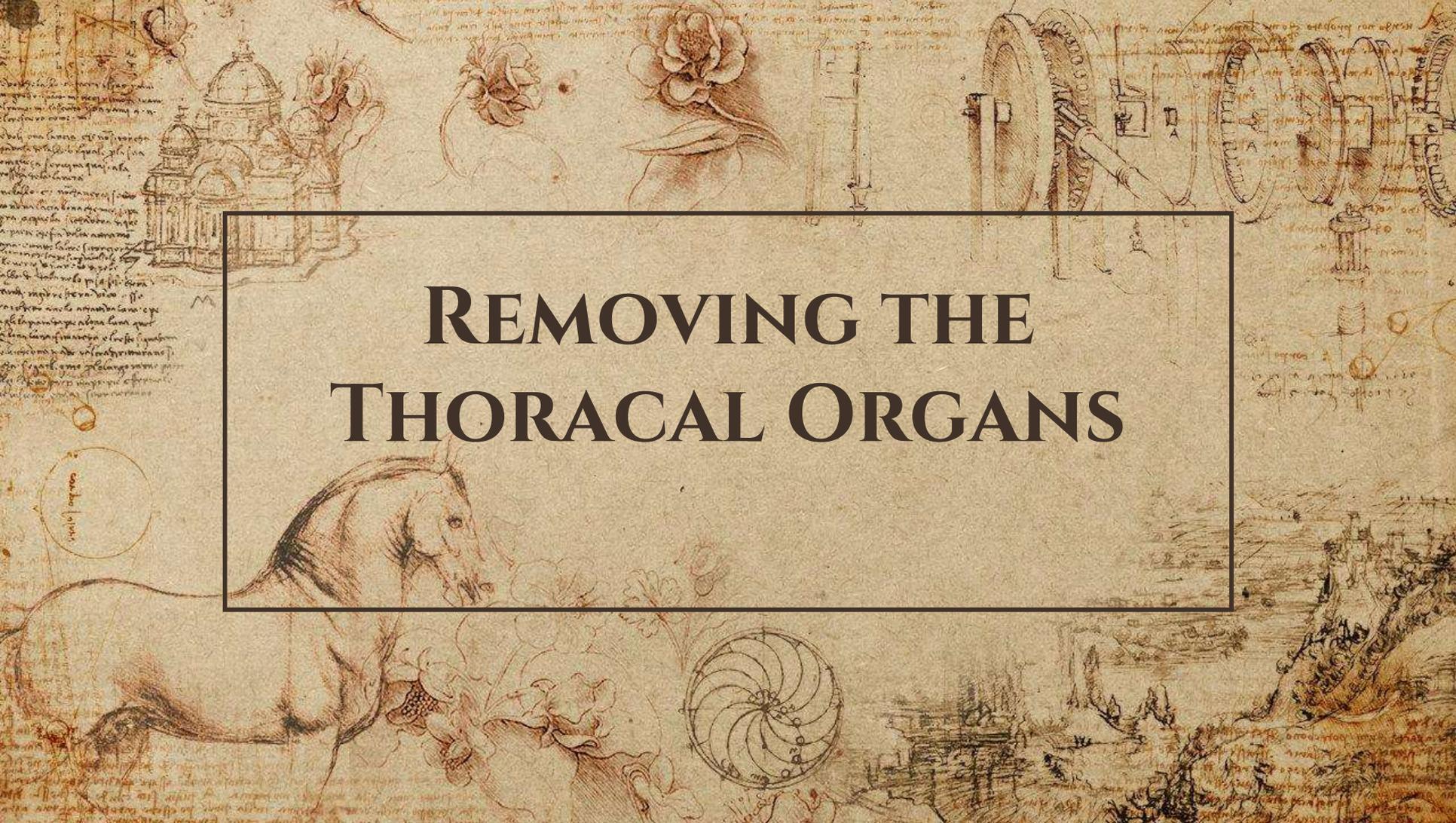
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- ✦ *For the cranial 1/3, separate the trachea and esophageus all the way to the mandible.*
- ✦ *Cut the hyoid bone through the joints, or via costatome.*

## IN SMALL ANIMALS

---

- ✦ *The tongue is taken out together with the cervical organs, lungs and heart.*
- ✦ *To remove them without cutting the mandible, make two cuts on the medial of ramus mandible, meeting behind the symphysis mandible.*
- ✦ *Cut frenulum lingua, lift and pull back the tongue, while cutting the hyoid bone, connections, and muscles.*

The background of the slide is a collage of Leonardo da Vinci's anatomical sketches. In the top left, there is a drawing of a domed building. To its right are several detailed drawings of flowers. Further right, there are complex mechanical diagrams with gears and levers. In the bottom left, a horse is shown in profile, with a detailed anatomical drawing of its head and neck. In the bottom center, there is a circular diagram with spiral lines. The entire background is filled with faint, handwritten text in Leonardo's characteristic cursive script.

# REMOVING THE THORACAL ORGANS

## REMOVING THORACAL ORGANS

---

- ✦ *Take the lungs and heart together with the trachea, esophagus, tongue, larynx, and thyroids in small animals*
- ✦ *Take the lungs and heart with the last 2/3 of the trachea and esophagus in animals with a long neck*

## IN SMALL ANIMALS

---

- ✦ *There are two different methods to choose from, if you are cutting the mandible.*
- ✦ *Clean the masseters, and the muscles at the back of the mouth, then cut the symphysis mandible.*
- ✦ *Clean the masseters, make two cuts; one on the corpus mandible, the other right in front of the premolars.*



SEPERATING THE HEAD  
AND OPENING THE  
SKULL

## SEPERATING THE HEAD

---

- ✦ *Tilt the head back*
- ✦ *Cut the muscles around the atlanto-occipital joint. Move the head up and down to estimate the joint.*
- ✦ *Cut the joint capsule.*
- ✦ *Insert the knife vertically in between the joint surfaces, twist the knife to dislocate the joint.*
- ✦ *Cut the surrounding tissues and seperate the head from the body.*

## TO TAKE CSF SAMPLE..

---

- ✦ *The CSF sample can be taken from the dorsal side of the animal, by inserting the syringe to the atlantooccipital joint.*
- ✦ *It can also be taken during the removal of the head. After cutting the muscles from ventral, you can insert the syringe in the atlanto-occipital joint to take the sample.*

# OPENING THE SKULL

---

- ✦ *The skin should be removed if not before.*
- ✦ *Remove the muscles of the cranium.*
- ✦ *Find the processus zygomaticus on both side. Imagine an arch between them. Make a cut approximately 1 cm behind that arch. (2-3 cm aborally in long-nosed animals)*

# OPENING THE SKULL

---

- ✦ *Make two additional cuts starting on both edges of the first cut, ending in foramen magnum. (dorso-medial of the condyles.*
- ✦ *Return to the first cut, insert the back of the knife and twist the knife to lift the calvarium. Repeat for the lateral cuts.*
- ✦ *Remove the calvarium (with dura mater)*

## FOR HORNED ANIMALS..

---

- ✦ *Make an additional 4th cut through the mid-line of the skull.*
- ✦ *Push the horns down from both sides, and open the calvarium.*

## REMOVING THE BRAIN

---

- ✦ *Raise the head up, nose pointing upwards.*
- ✦ *Pull the brain back gently either with the scissors, or your fingers.*
- ✦ *The connections and bulbus olfactorius is cut with scissors as the brain starts to fall down slowly.*

# REMOVING THE PITUITARY GLAND

---

- ✦ *Pituitary gland on the basis of the skull, in cella turcica.*
- ✦ *Lift a narrow piece of dura mater with a thin blade. Starting close to the foramen magnum. Go all the way to the pituitary.*
- ✦ *Make a round cut and remove the pituitary gently.*

## REMOVING THE EYE

---

- ✦ *Hold the skin left around the eye and pull the eye outwards.*
- ✦ *Using a thin knife or curved scissors, cut the connections around the eye.*
- ✦ *Take the eye out, with leaving the optic nerve on the eye.*

## SEPERATING THE MANDIBLE

---

- ✦ *Remove the masseters and cut the muscles and connections at the back of the mouth and around the temporo-mandibular joint.*
- ✦ *Push the mandible and maxilla away from each other.*

## OPENING THE NASAL CAVITY

---

- ✦ *Cut the bone structure of the nose transversally from in front of the orbits and separate the nasal part of the skull.*
- ✦ *Then cut the removed part into two pieces following the median line.*
- ✦ *After exposing the septum nasi, cut it with a knife and both sides of the nasal cavity are checked.*

# OPENING THE NASAL CAVITY

---

✦ *Cut the rest of the skull in half and check the sinuses*

## OPENING THE NASAL CAVITY

---

✦ *Cut the skull in half, if the mandible is not removed, cut the symphysis mandible too, to divide the skull into two pieces.*

## OPENING THE NASAL CAVITY

---

 The nasal cavity can be opened by cutting the overlying bone horizontally in calves, or two separate cuts can be made on the nasal bones in pigs.

# SEPERATING THE SPINAL CORD AND REMOVING THE MS

---

✦ *The vertebral canal should be removed from the carcass. (from atlas to sacrum)*

# SEPERATING THE SPINAL CORD AND REMOVING THE MS

---

✦ *Remove the muscles around the vertebral canal.*

# SEPERATING THE SPINAL CORD AND REMOVING THE MS

---

- ✦ *Cut the vertebrae in a «V» shape, from both sides, between the Proc. Spinosus and Proc. Transversus.*
- ✦ *Expose the medulla spinalis*
- ✦ *Remove the medulla spinalis by cutting the branches leaving the canal.*

The background of the image is a collage of Leonardo da Vinci's anatomical sketches. In the top left, there is a drawing of a domed building, possibly a church or a fortification. To its right are several detailed drawings of flowers, including a large rose and a smaller one. Further right, there are intricate mechanical diagrams showing gears and levers. In the bottom left, a horse is depicted in profile, facing right. In the bottom center, there is a circular diagram with a spiral pattern inside. The entire background is filled with faint, handwritten text in Leonardo's characteristic cursive script.

# OPENING THE PELVIC CAVITY

# OPENING THE PELVIC CAVITY

---

- ✦ *Not obligatory*
- ✦ *To remove the rectum, with the genital organs and urinary system organs.*
- ✦ *Either the pelvic bone can be cut, or a circular cut can be made to pull the organs out from the abdominal cavity.*

# OPENING THE PELVIC CAVITY

---

## Symphysis Pelvis

*Remove the muscles.  
Then, cut symphysis  
pelvis from pecten ossis  
pubis to arcus  
ischiadicus.*

## Lateral

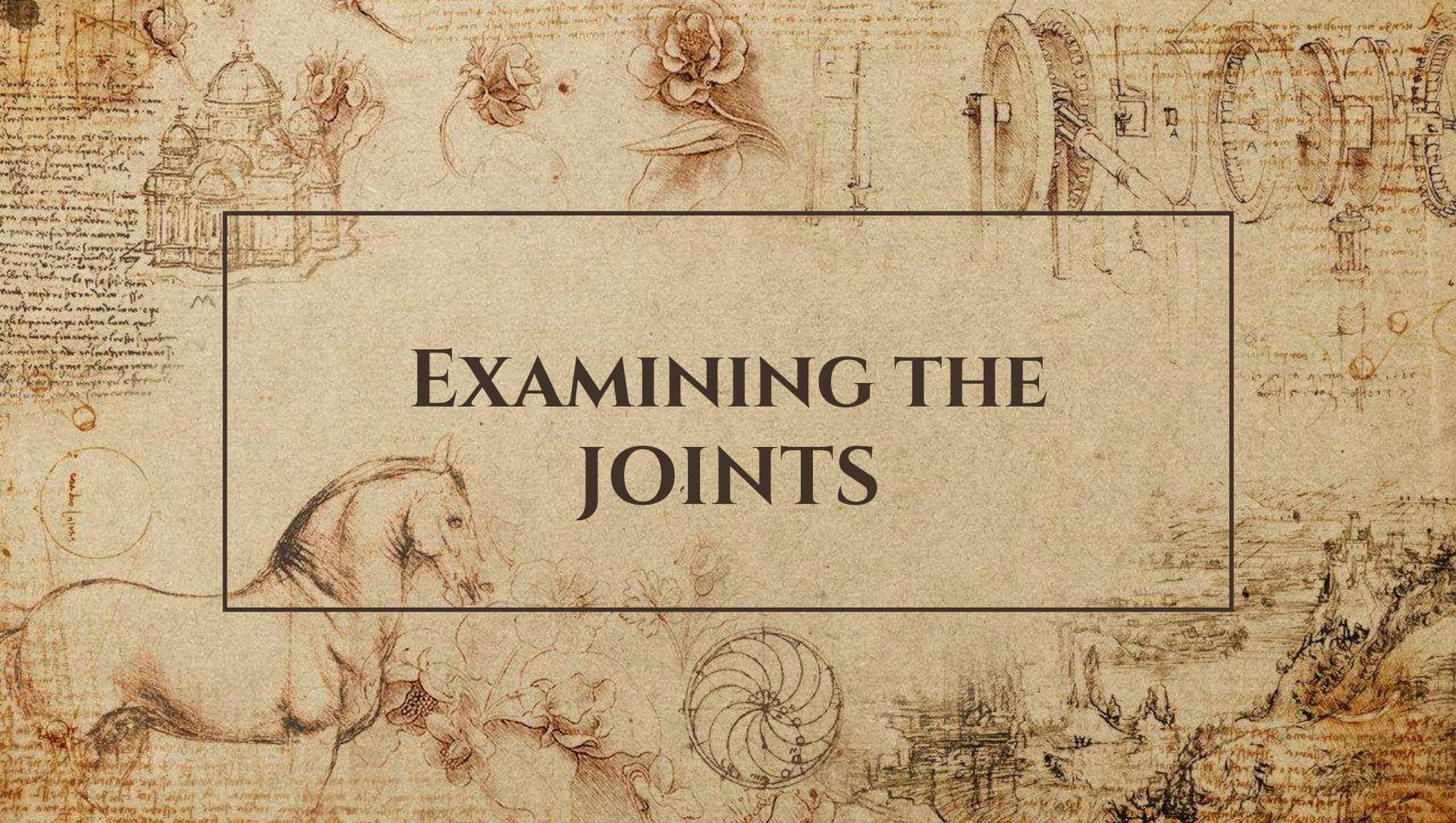
*Remove the muscles.*

*Make a cut passing through the overlying  
foramen obturatum. Then cut the same  
corpus ileum.*

## Foramen Obturatum

*Remove the muscles.*

*Make two cuts on the  
bones, parallel to the  
symphysis pelvis.*



# EXAMINING THE JOINTS

# EXAMINING THE JOINTS

---

✦ *Remove the muscles around the joint*

✦ *Cut from the medial side of the antebrachium and extend up to the humerus.*

# EXAMINING THE JOINTS

---

✦ *Remove the muscles around the joint*

✦ *Bend the knee, find the patella and make the cut distally to the patella.*

# EXAMINING THE JOINTS

---

✦ *Make 3 cuts on the distal end of the radius, in between the carpal bones, and proximal end of the metacarpi.*

# EXAMINING THE JOINTS

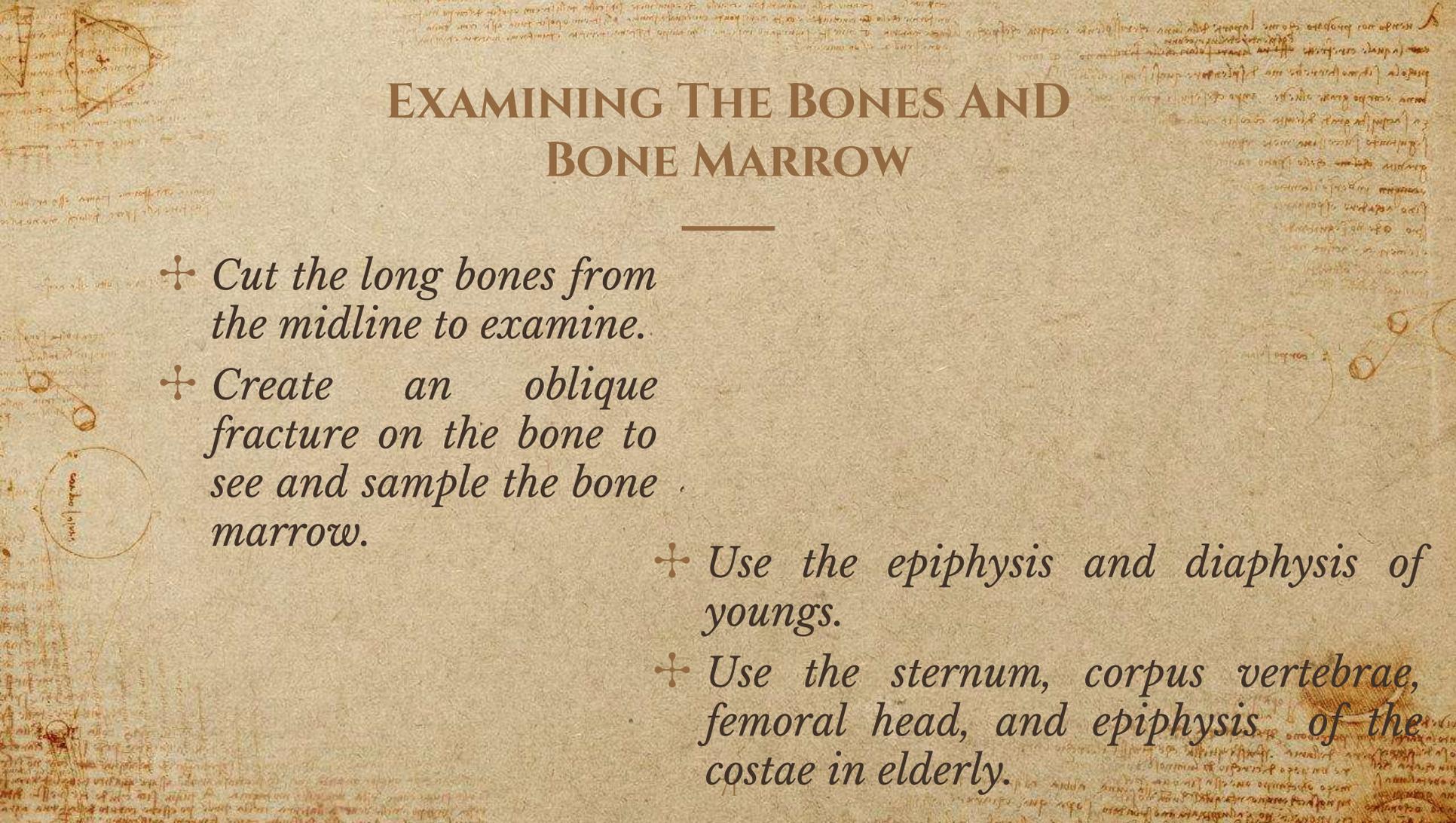
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✦ *Make a cut on the distal end of tibia.*

# EXAMINING THE JOINTS

---

- ✦ *Cut the Corium coranarium from the front, extend the sections to the sides.*
- ✦ *Insert the knife into the cut and separate the ungulae.*



# EXAMINING THE BONES AND BONE MARROW

---

- ✦ *Cut the long bones from the midline to examine.*
- ✦ *Create an oblique fracture on the bone to see and sample the bone marrow.*
- ✦ *Use the epiphysis and diaphysis of youngs.*
- ✦ *Use the sternum, corpus vertebrae, femoral head, and epiphysis of the costae in elderly.*