



Biomedical Technologies  
Clinical Cases and Consequences for Medical Devices I

# Benign disorders of the anorectum

C. Falch

## Learning goals

- ▶ Acquisition of knowledge in the surgical anatomy of the anorectum and the pelvic floor as well as basic knowledge in organ-specific physiology
- ▶ Acquisition of knowledge in the diagnosis and surgical treatment of the discussed diseases of the anorectum and pelvic floor
- ▶ Objective assessment: exam





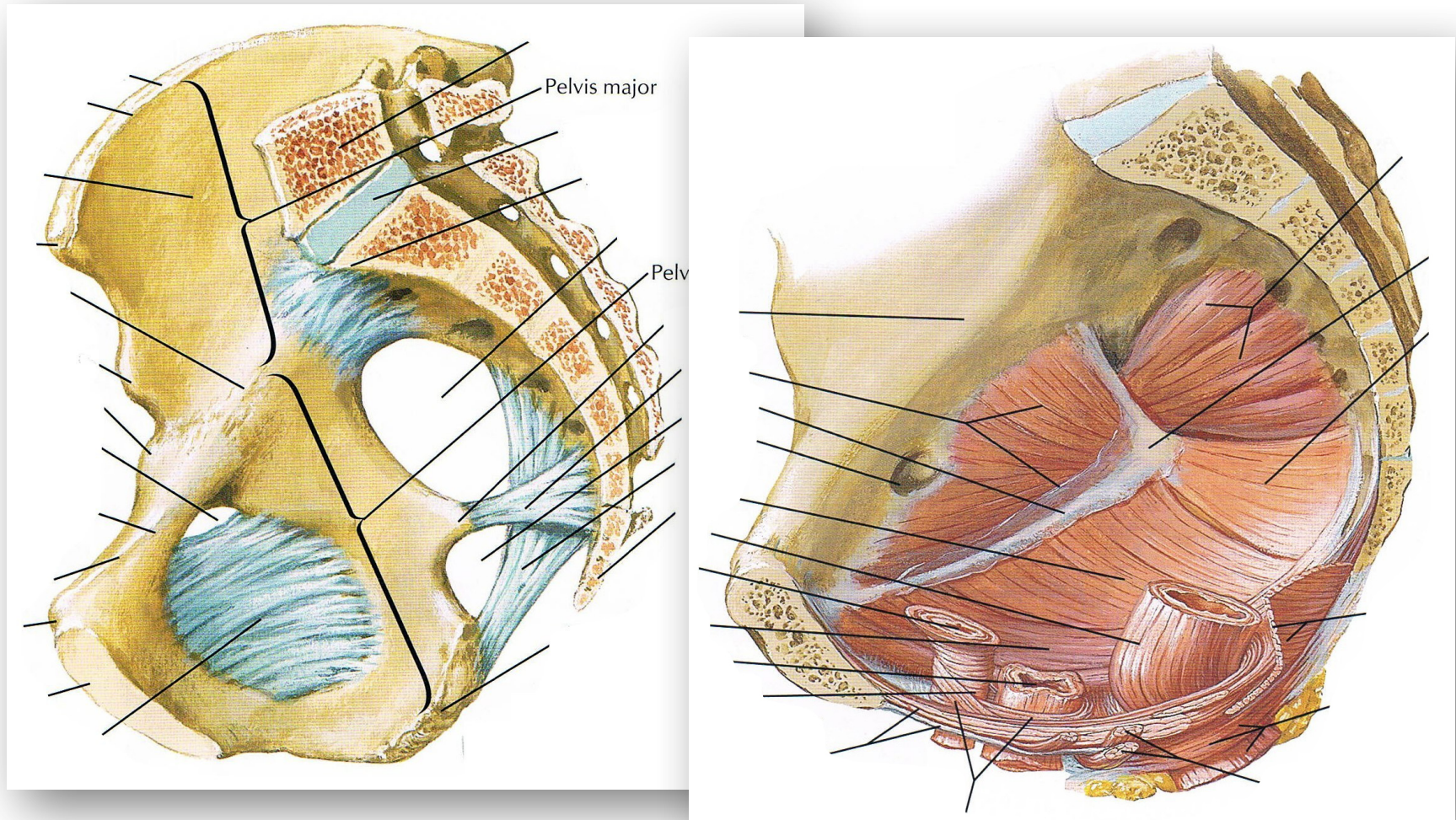
# *Anatomy & Physiology*

## Agenda

- surgical anatomy of the anorectum
- case examples for common disease in the field
- etiology of the diseases
- available and useful diagnostics
- therapy

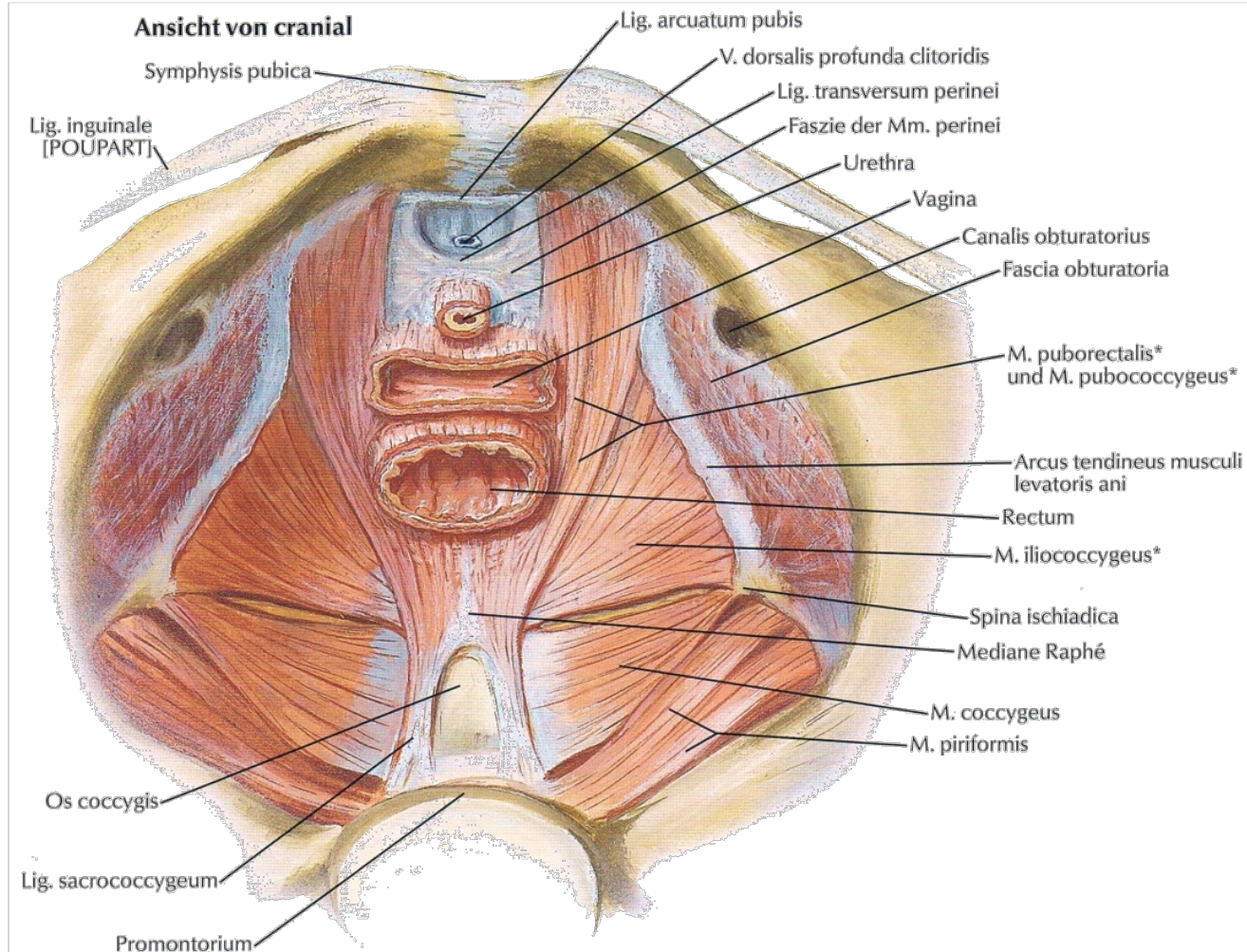


# Surgical anatomy - pelvic floor



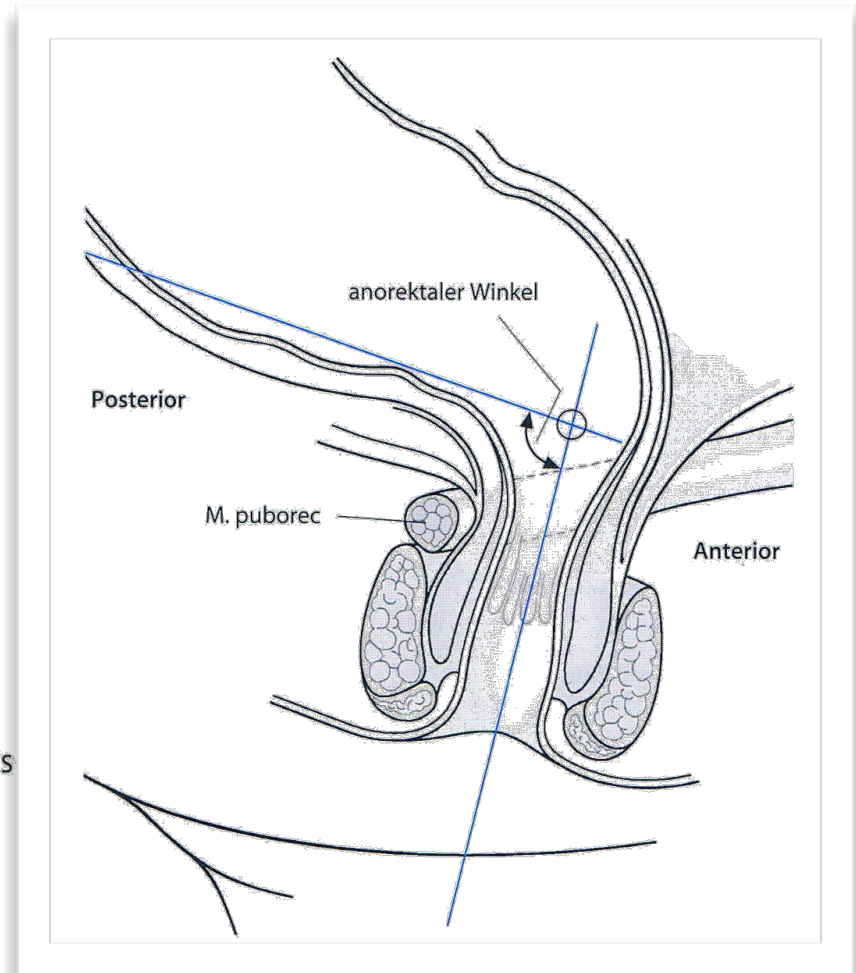
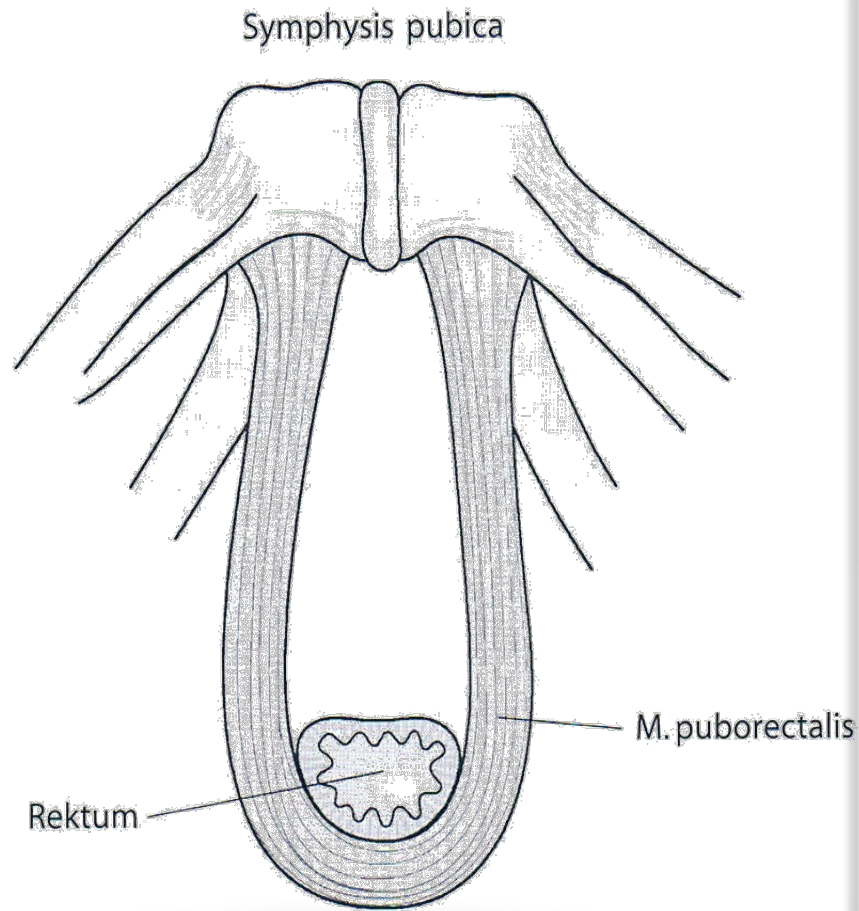


# Surgical anatomy - pelvic floor





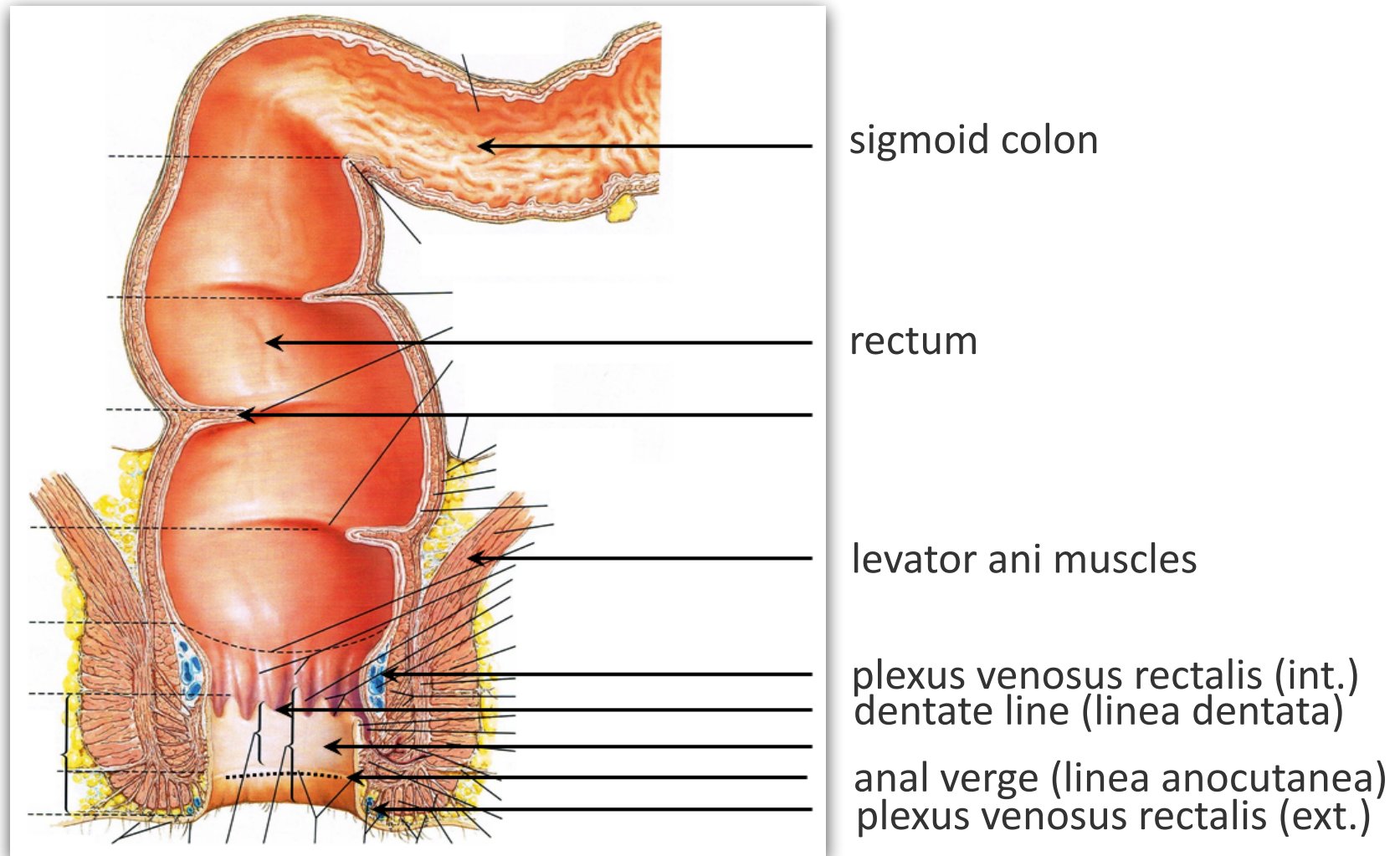
# Physiology - the anterior posterior angle (anorectal flexure)



## Surgical anatomy - Pelvic floor and anal sphincter

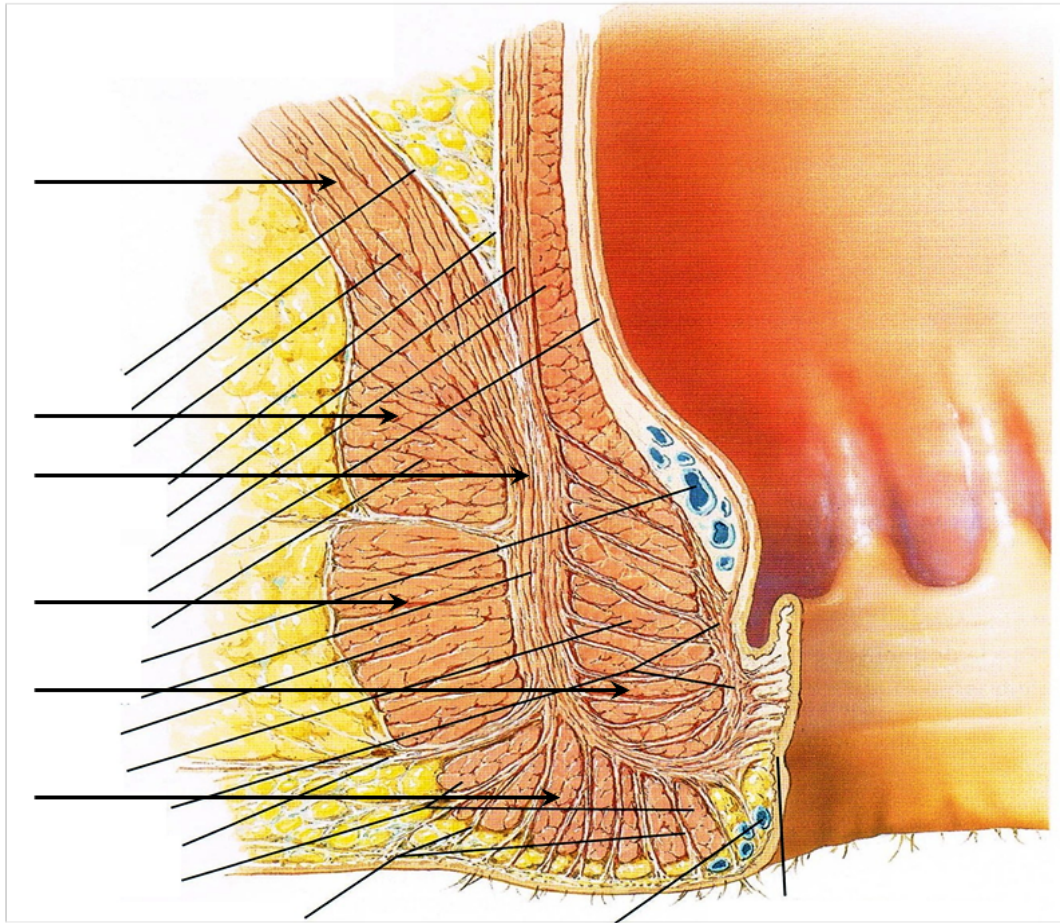
- **levator ani muscles (M. levator ani)**
  - M. puborectalis (the anterior posterior angle / anorectal flexure)
  - Pars pubica (M. pubococcygeus) median
  - Pars iliaca (M. iliococcygeus) lateral
- **sphincter muscles**
  - M. sphincter ani internus (rectoanal inhibitory reflex)
  - Intersphincteric layer
  - M. sphincter ani externus
  - pars profunda, pars superficialis, pars subcutanea

# Surgical anatomy - anorectum & pelvic floor



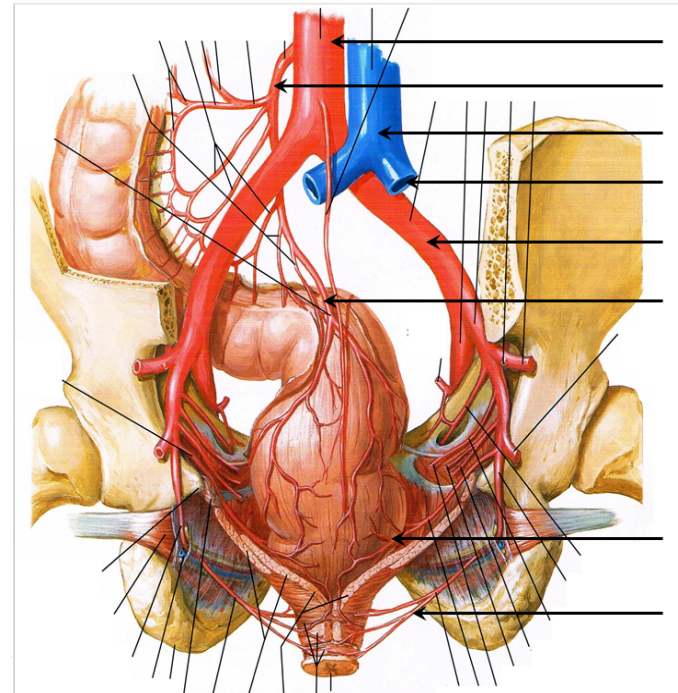


# Surgical anatomy - sphincter muscles



## Surgical anatomy - vascularization

- superior rectal artery (inferior mesenteric artery)
- middle rectal artery (iliac artery, twofold)
- inferior rectal artery (iliac artery, twofold)
- the veins accompany the arteries



# Surgical anatomy - peripheral nervous system

- **Autonomic nervous system**

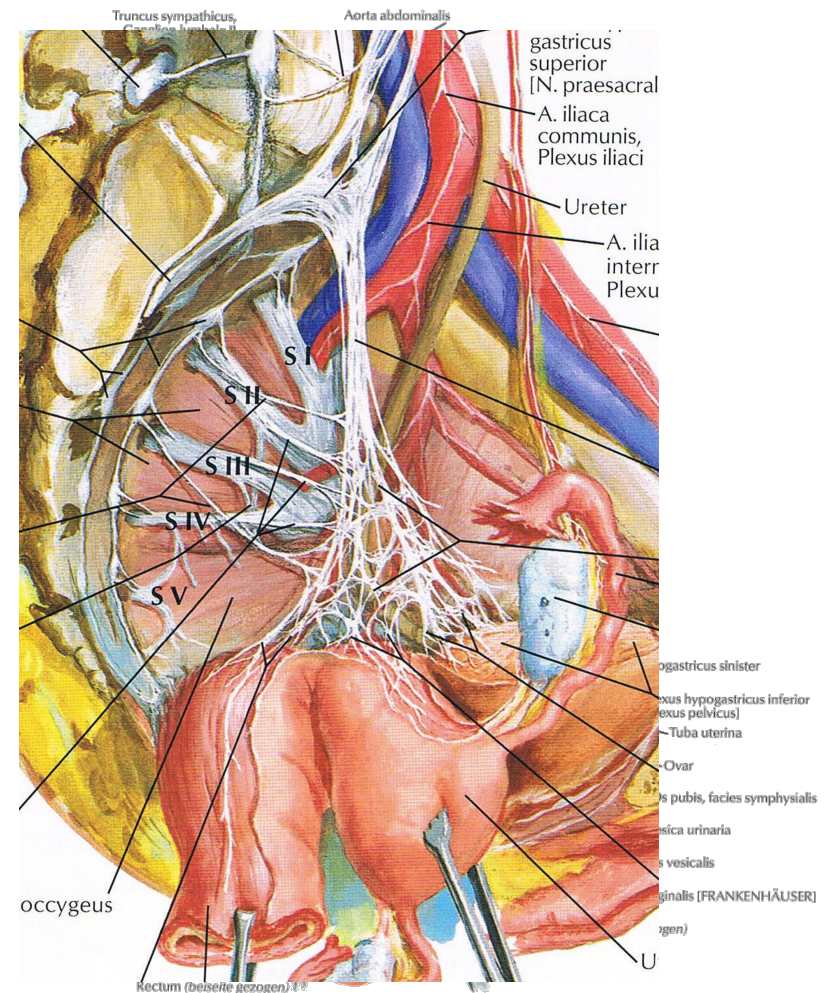
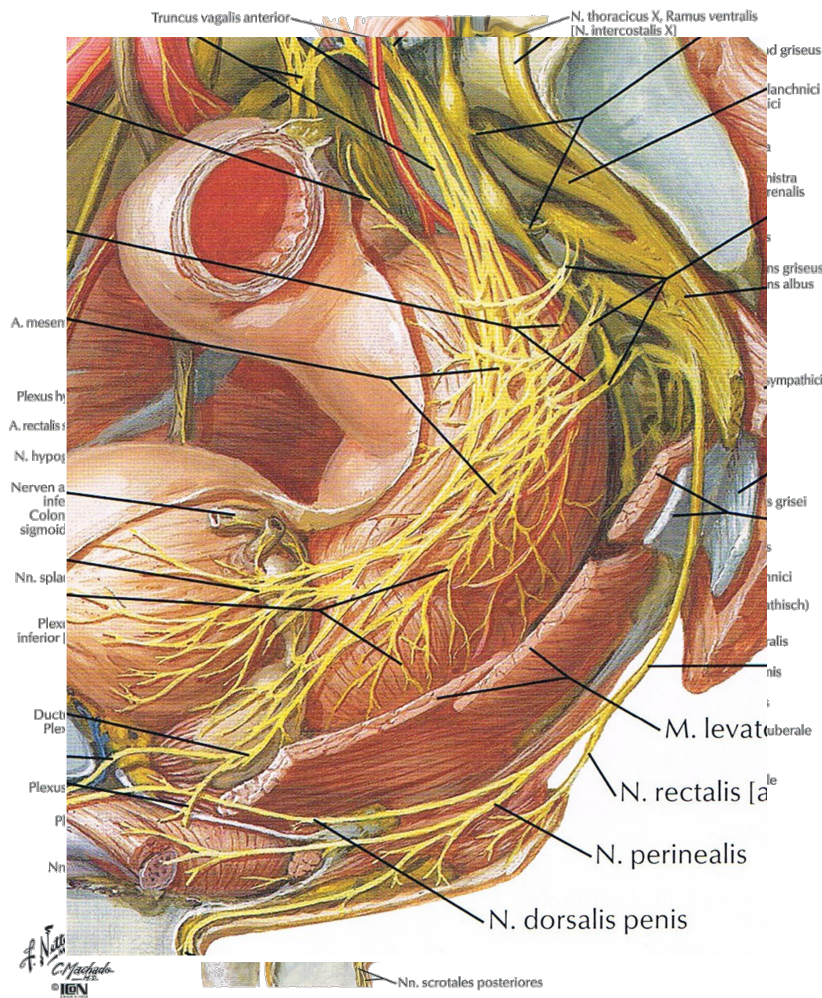
- Plexus mesentericus inferior
- Plexus intermesentericus
- Plexus hypogastricus superior
- N. hypogastricus dexter et sinister
- Plexus hypogastricus inferior (Plexus pelvicus)

- ▶ **Somatic nervous system**

- pudendal nerve (S2 – S4)



# Surgical anatomy - peripheral nervous system



## CASE 1

- gender: male
- age: 45 years
- BMI: 31,4 kg/m<sup>2</sup>
- Symptoms:
  - pruritus ani (itching)
  - blood deposits on stool
  - no pain
- Medical history:
  - arterial hypertension
  - appendectomy (child)

## Proctology examination

- the diagnostic investigation depends on the symptoms
- routine diagnostics
  - medical history !!!
  - inspection
  - clinical examination
  - proctoscopy / rectoscopy



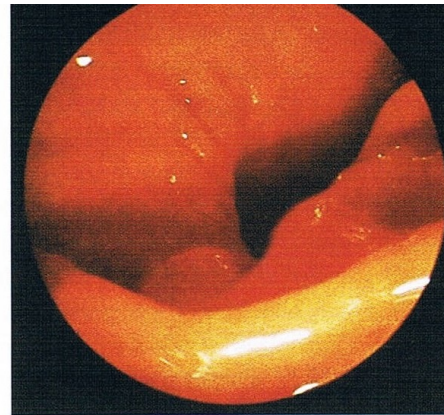
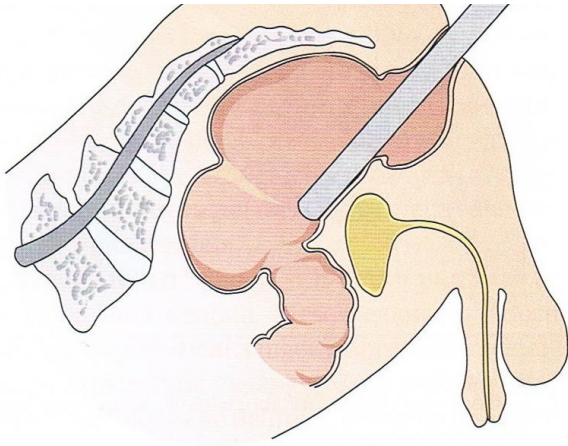


# Proctoscopy / Rectoscopy

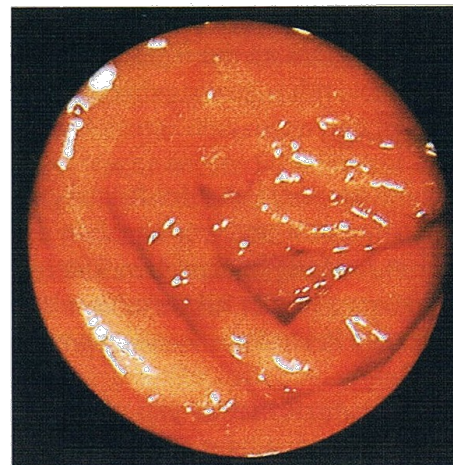
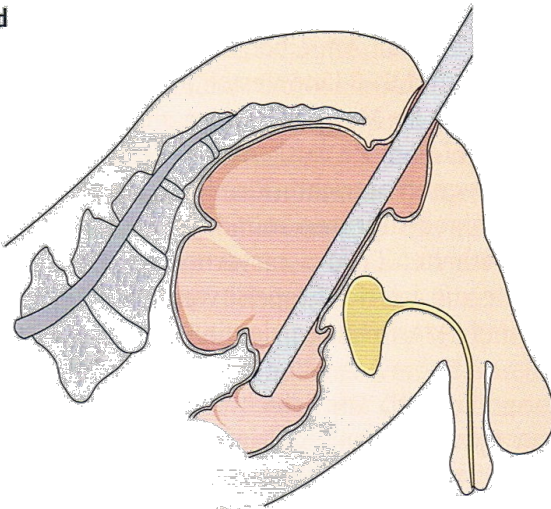




# Rectoscopy

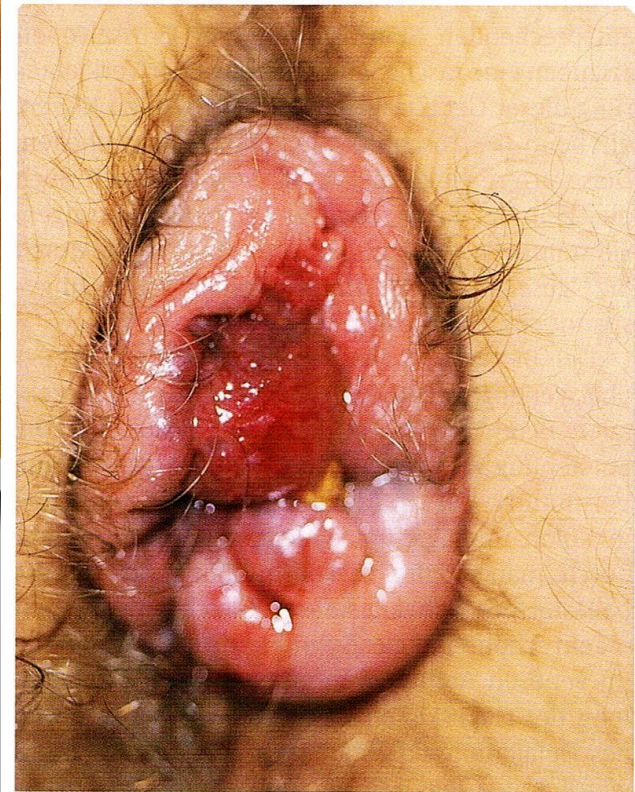
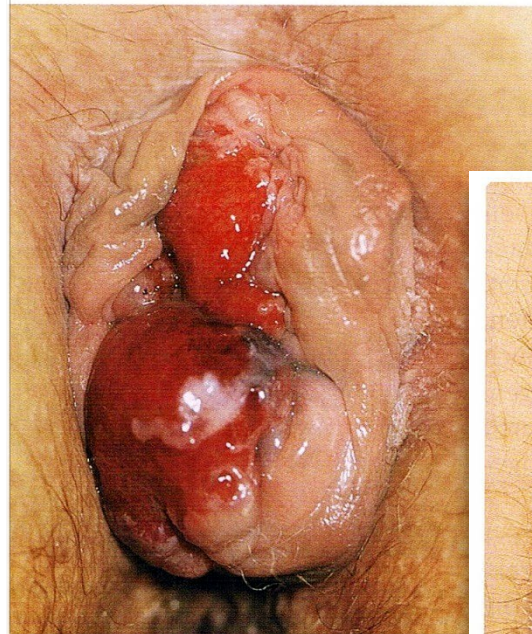


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# Haemorrhoids - clinical stages



## Haemorrhoids - clinical stages

| degree | characteristic                                                                         |
|--------|----------------------------------------------------------------------------------------|
| I°     | enlargement of the corpus cavernosum recti<br>(proctoscopy! normal rectal examination) |
| II°    | prolaps during bowel movements – spontaneous reposition                                |
| III°   | prolaps during bowel movements – manual repositioning necessary                        |
| IV°    | fixed prolapse, fibrosis, thrombosed - irreducible                                     |



## Differential diagnosis: anal vein thrombosis





# Haemorrhoids

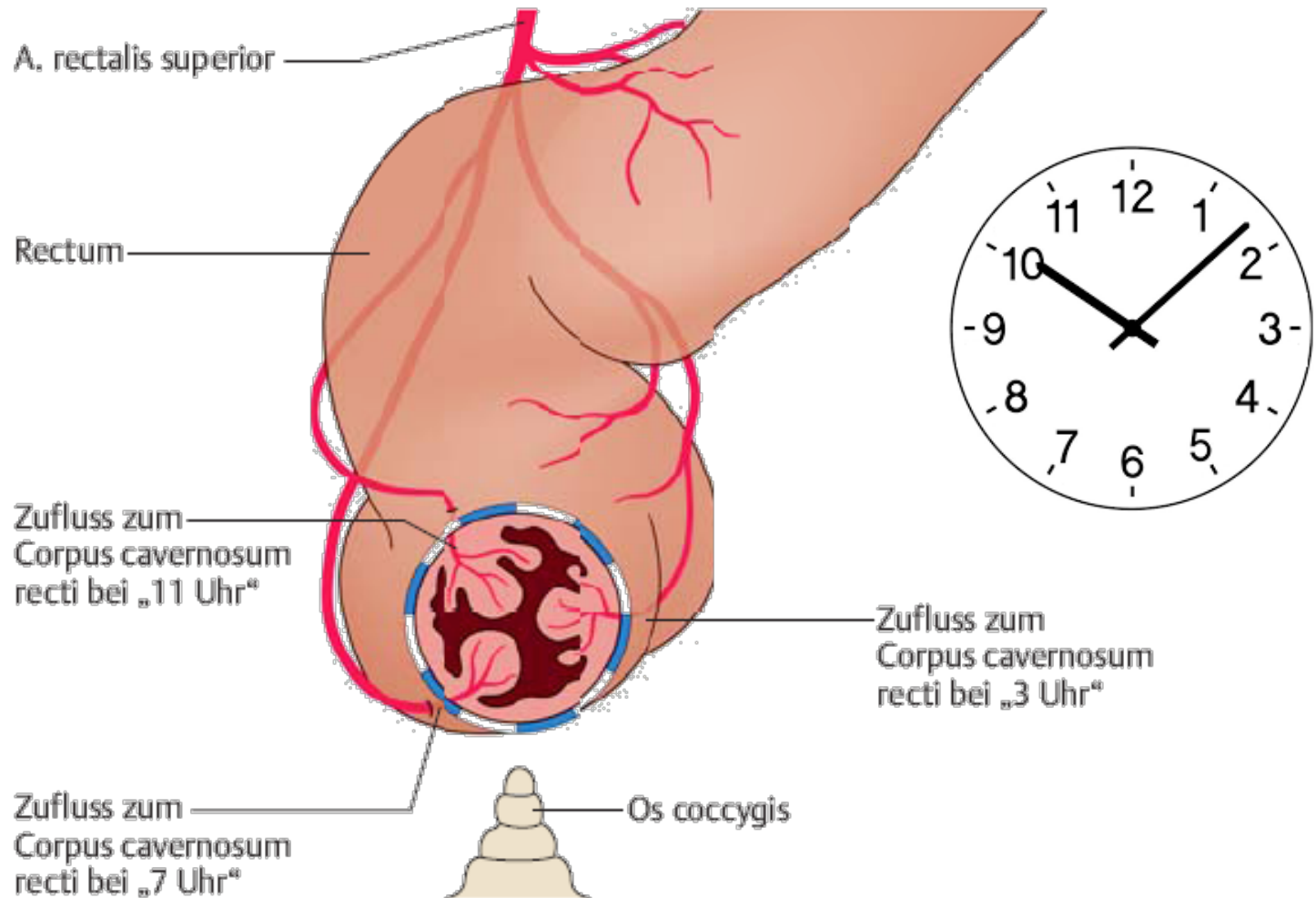
- **Epidemiology**

- 70% of adults in industrialized countries (treated 4%)
- Incidence of hemorrhoidectomy 40-50 / 100.000

- **Pathogenesis**

- Corpus cavernosum recti (fine continence)
  - ➡ circularly arranged arteriovenous vascular convolute
- Hemorrhoids at hyperplasia
- clinical relevance if symptomatic
- common sites at 3°, 7° and 11° (lithotomy position)

# Surgical anatomy - common sites of haemorrhoids



## Haemorrhoids - etiology

- genetics
- due to impaired defecation / inadequate stool consistency
- chronic constipation (push out stool)
- chronic diarrhea (insufficient emptied convolute)
- pregnancy
- laxatives abuse
- obesity
- excessive alcohol and coffee consumption
- hot spices
- sitting on cold pad



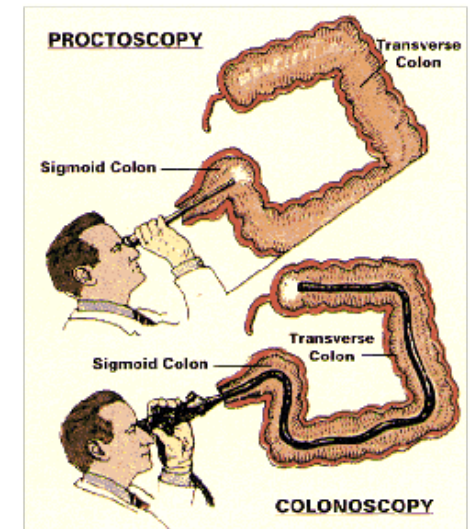
## Haemorrhoids - symptoms

- unspecific / not depending on the size
- deposits of blood / peranal bleeding (most common)
- moisture (disturbance of fine continence)
- itching (anal eczema)
- anal prolapse
- fecal incontinence
- pressure sensation (pain)



## Additional examinations

- colonoscopy
- X-ray imaging tests
  - Determination of colonic transit time
  - contrast barium enema (large intestine)
  - Evacuation proctography (defecography)
- (dynamic) pelvic magnetic resonance imaging (MRI)
- endoanal ultrasound (2D / 3D)
- anorectal manometry
- (electromyography (EMG) of the pelvic floor)

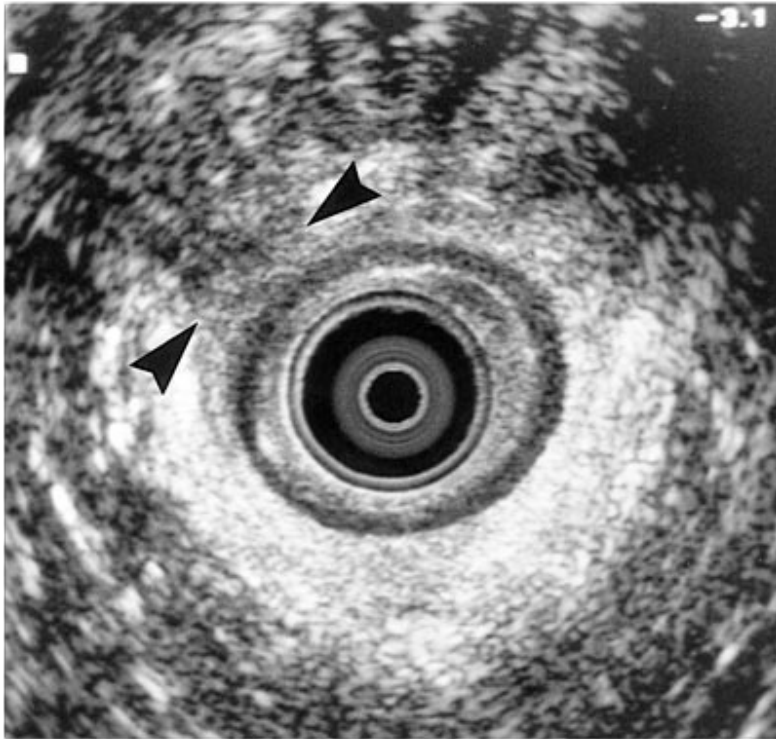


# MRI

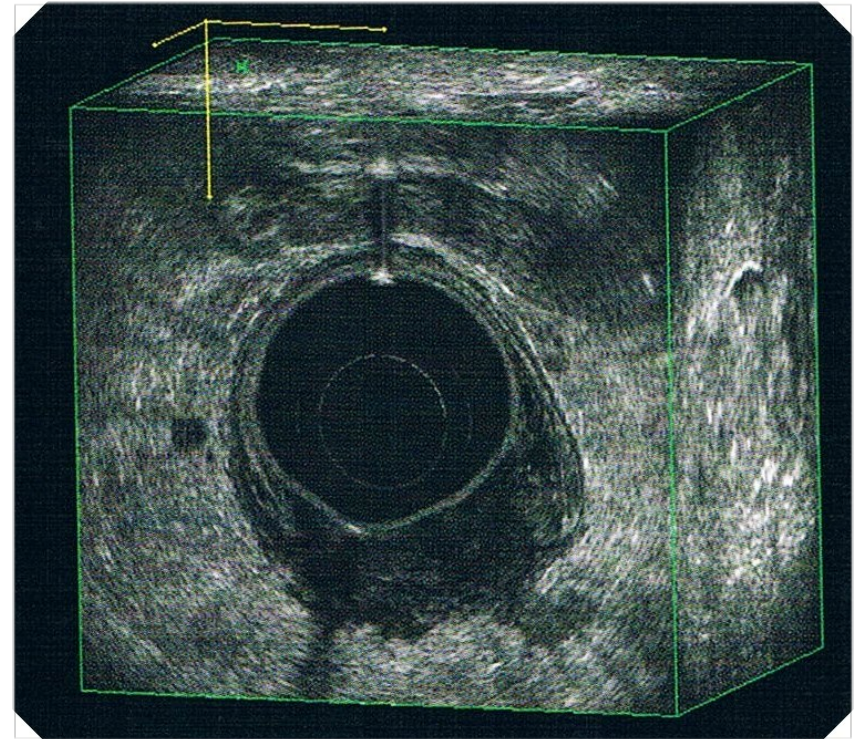




## Endoanal ultrasound (2D / 3D)

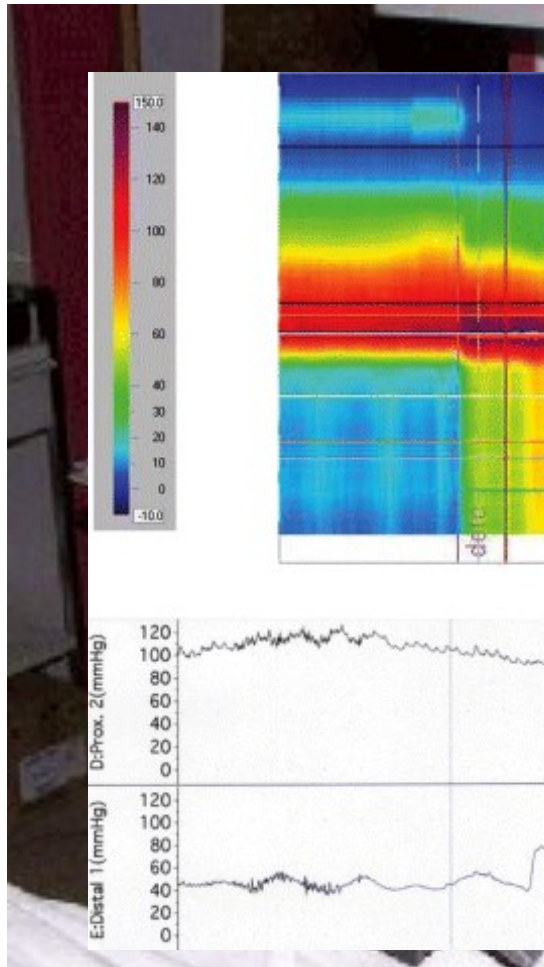


2D – defect of the anal sphincter

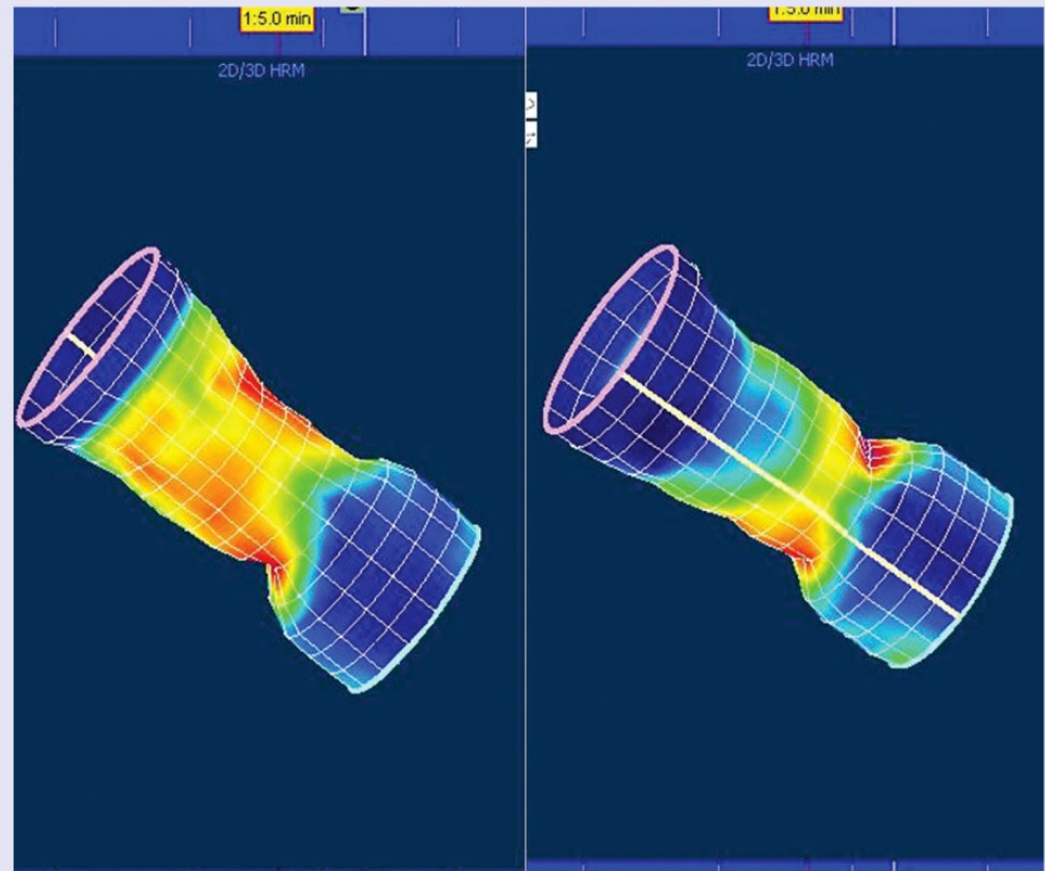


3D – tumor

# Anorectal Manometry



▼ **FIGURE 3:** Recent technical advances have allowed a manometric 3D reconstruction of the anal canal

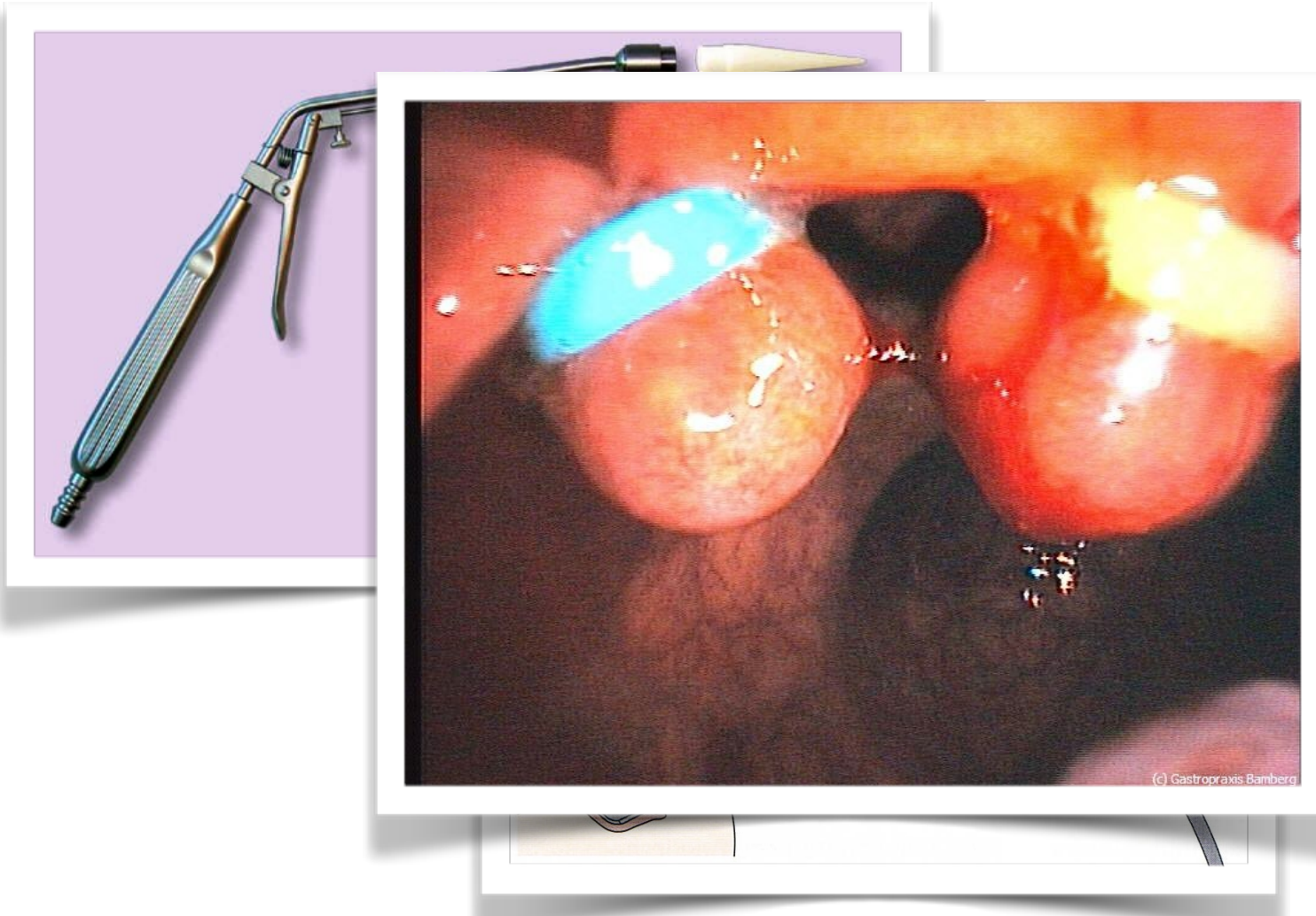


## Haemorrhoids - stage-adapted therapy

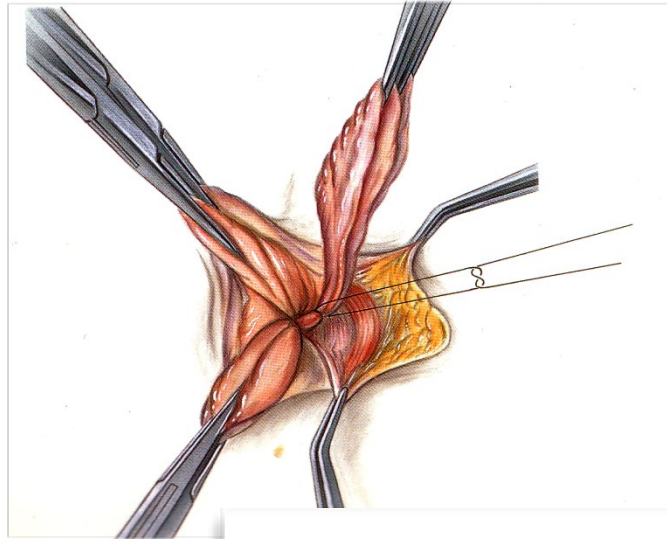
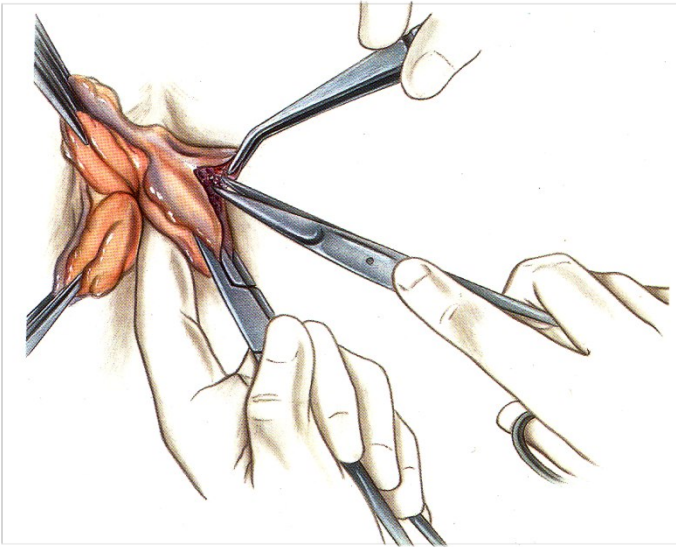
| degree | therapy                                                                                                                                                                                                                                                             |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        | <ul style="list-style-type: none"><li>• high-fiber diet, improvement of defecation behavior</li></ul>                                                                                                                                                               |
| I°     | <ul style="list-style-type: none"><li>• sclerotherapy (injections),</li><li>• doppler guided hemorrhoidal arterial ligation (DGHAL)</li></ul>                                                                                                                       |
| II°    | <ul style="list-style-type: none"><li>• rubber band ligation (Barron),</li><li>• doppler guided hemorrhoidal arterial ligation (DGHAL)</li></ul>                                                                                                                    |
| III°   | <ul style="list-style-type: none"><li>• rubber band ligation (Barron),</li><li>• doppler guided hemorrhoidal arterial ligation</li><li>• segmental: hemorrhoidectomy (e.g. Milligan-Morgan, Ferguson)</li><li>• circular: stapled hemorrhoidopexy (Longo)</li></ul> |
| IV°    | <ul style="list-style-type: none"><li>• acute stage (thrombosis, incarceration) → non-surgically</li><li>• secondary: hemorrhoidectomy (e.g. Milligan-Morgan, Parks)</li></ul>                                                                                      |

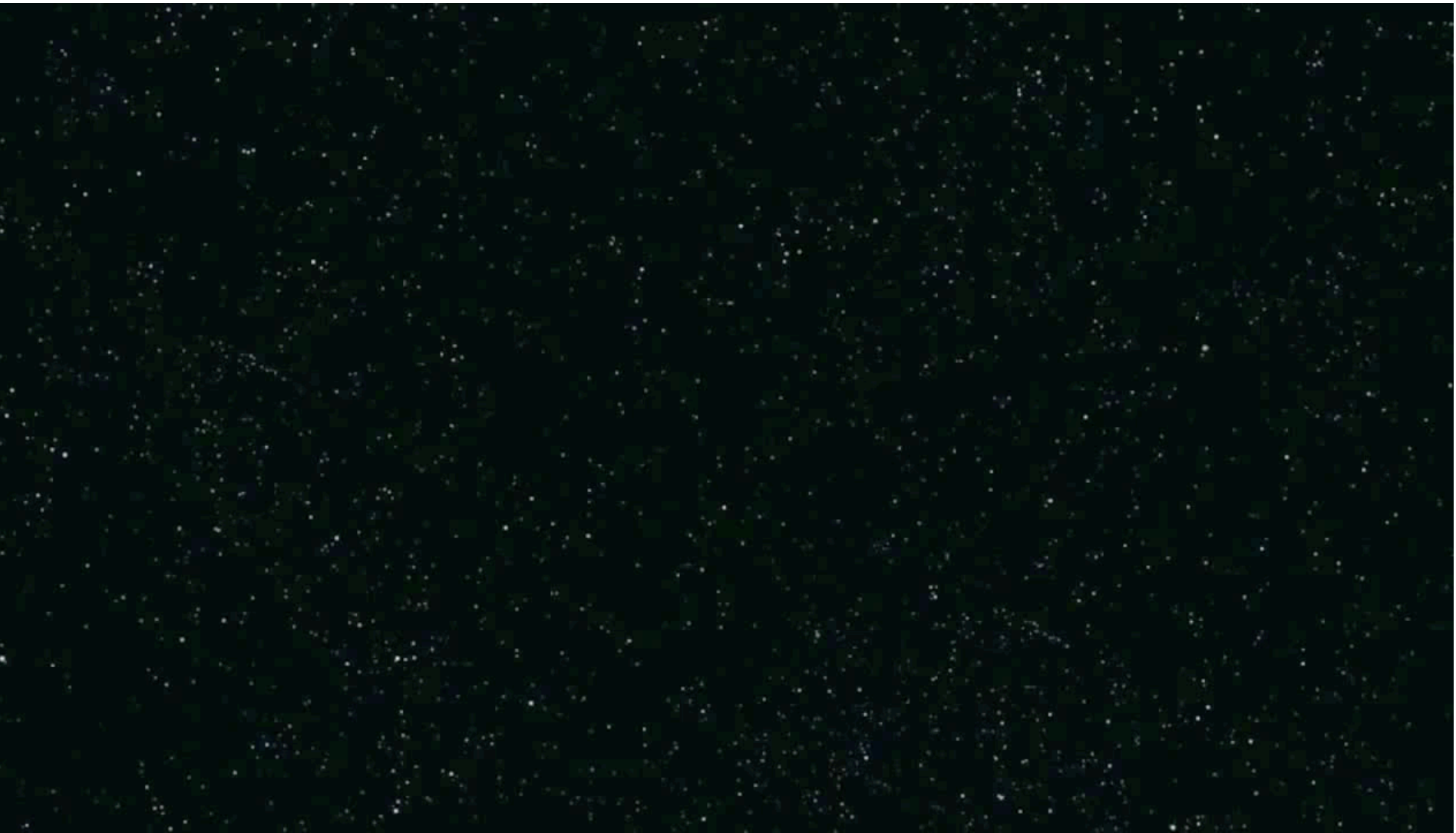


# Haemorrhoids - rubber band ligation (Barron)



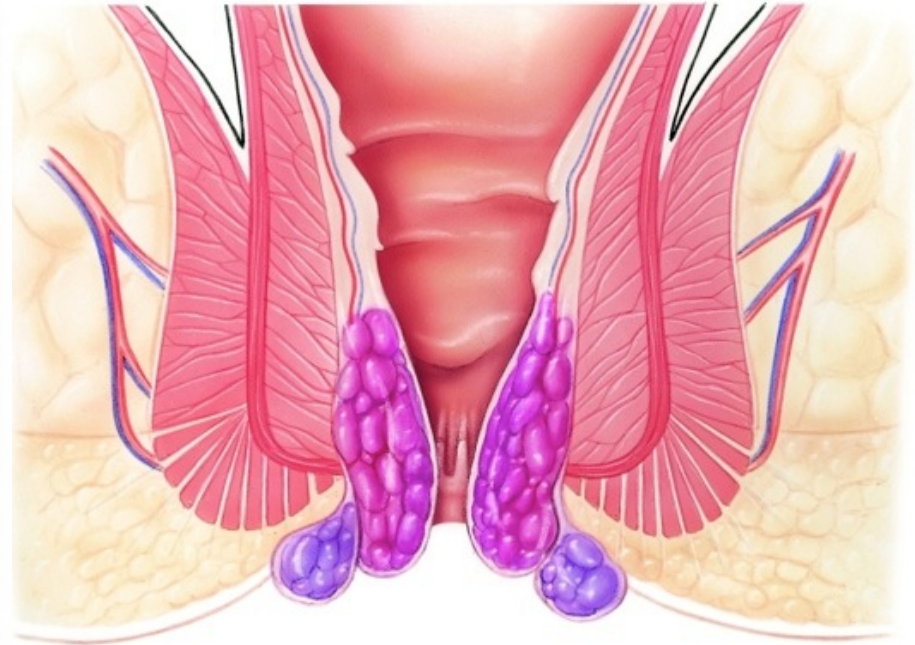
# hemorrhoidectomy (Milligan-Morgan)







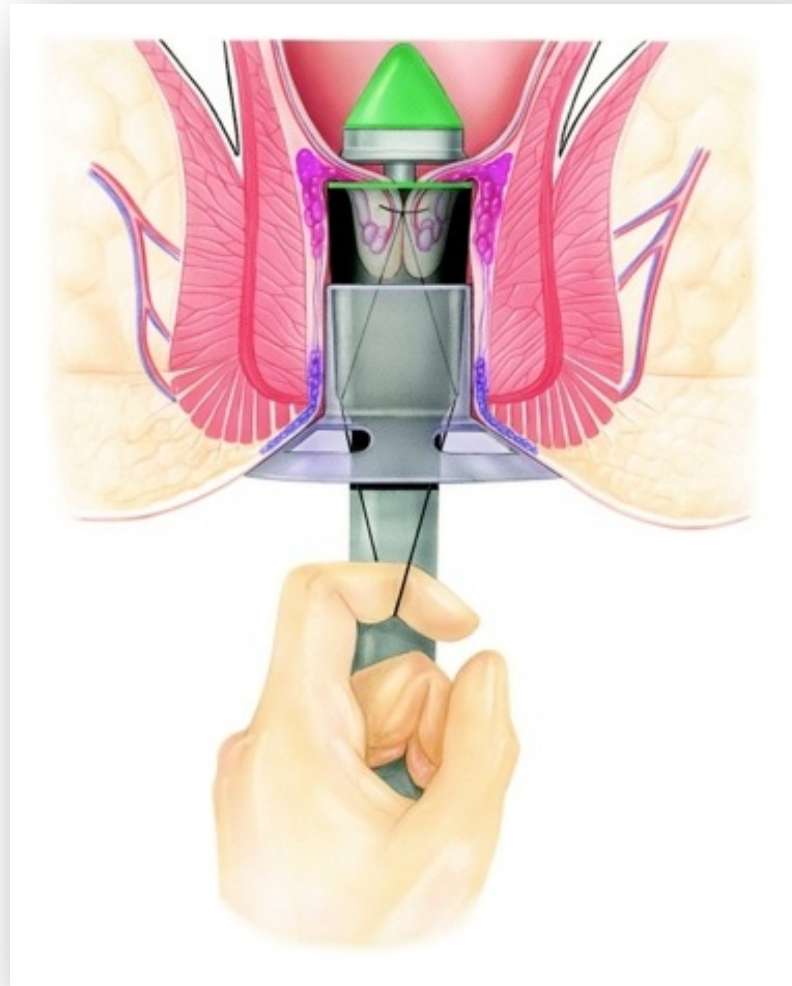
# Stapled hemorrhoidopexy (Longo)



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## Stapled hemorrhoidopexy (Longo)

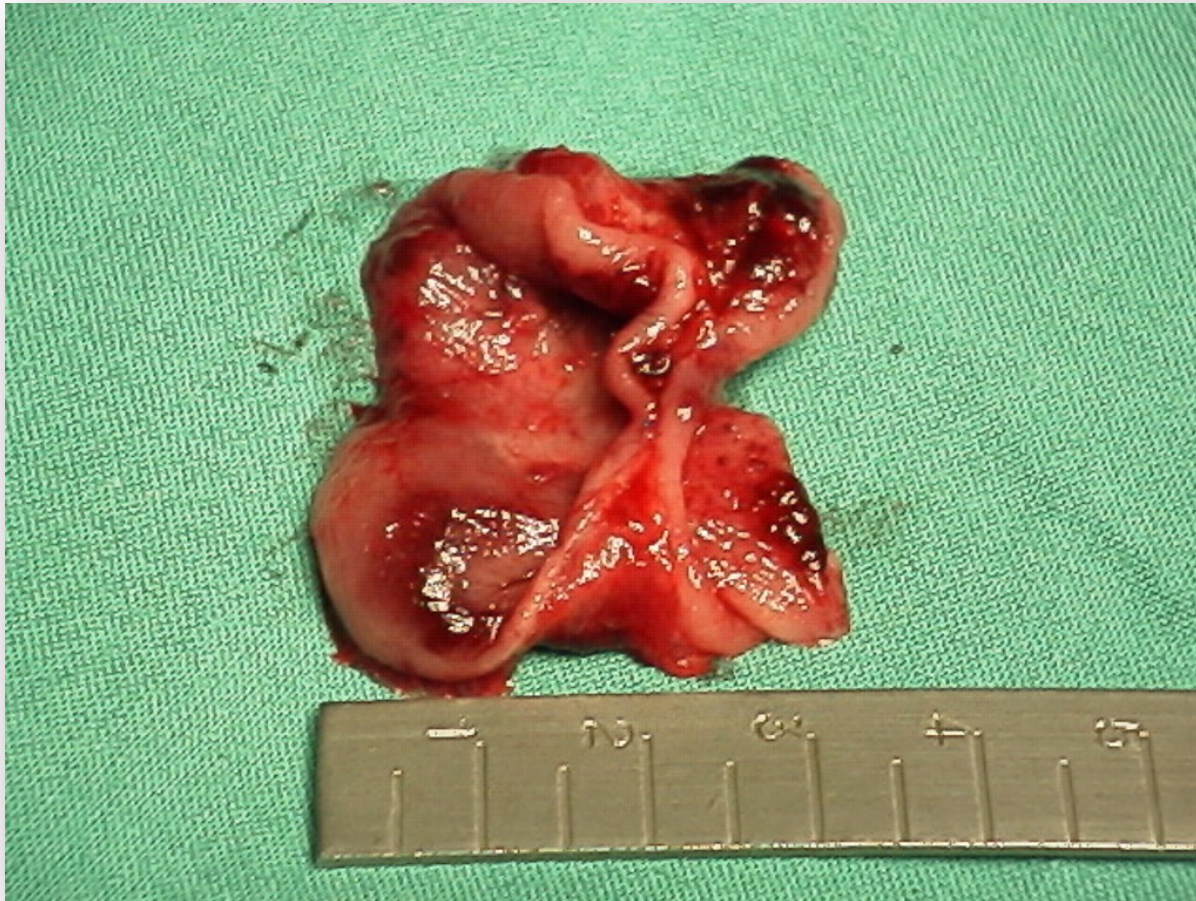




## Stapled hemorrhoidopexy (Longo)



## Stapled hemorrhoidopexy (Longo)



## CASE 2

- gender: female
- age: 51 years
- BMI: 24,3 kg/m<sup>2</sup>
- Symptoms:
  - severe pain perianal
  - swelling perianal
  - no bowel movement for 3 days
- Medical history:
  - two normal deliveries
  - tonsillectomy (child)

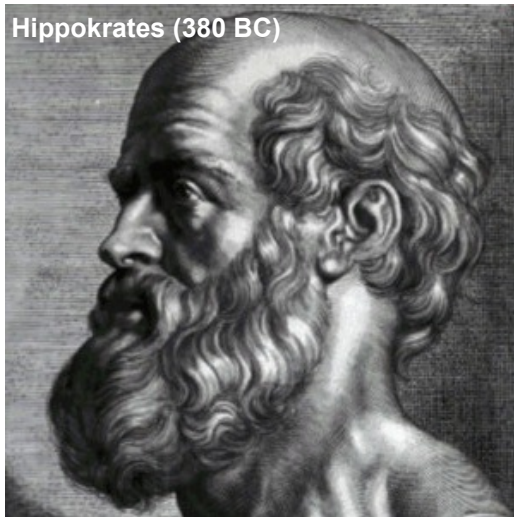


## Perianal /perirectal abscess & Anal fistula

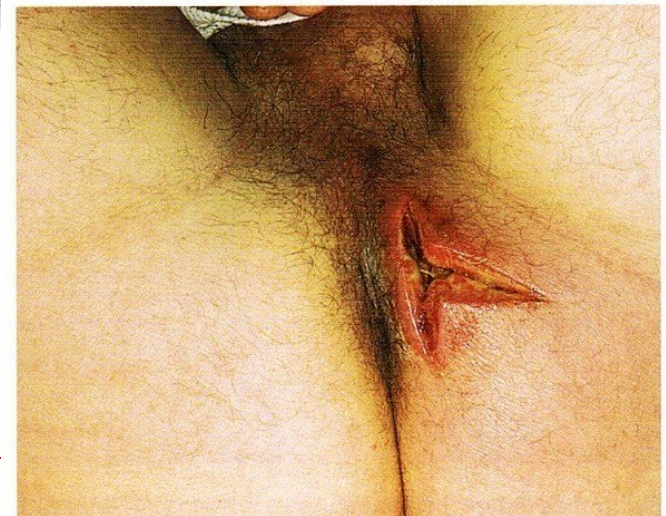
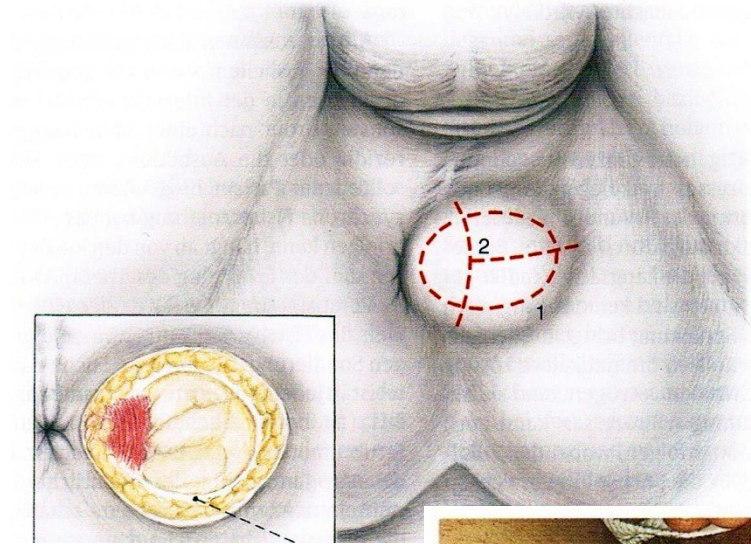


# Perianal /perirectal abscess

Hippokrates (380 BC)



„Ubi pus, ibi evacua“



## Perianal /perirectal abscess & Anal fistula

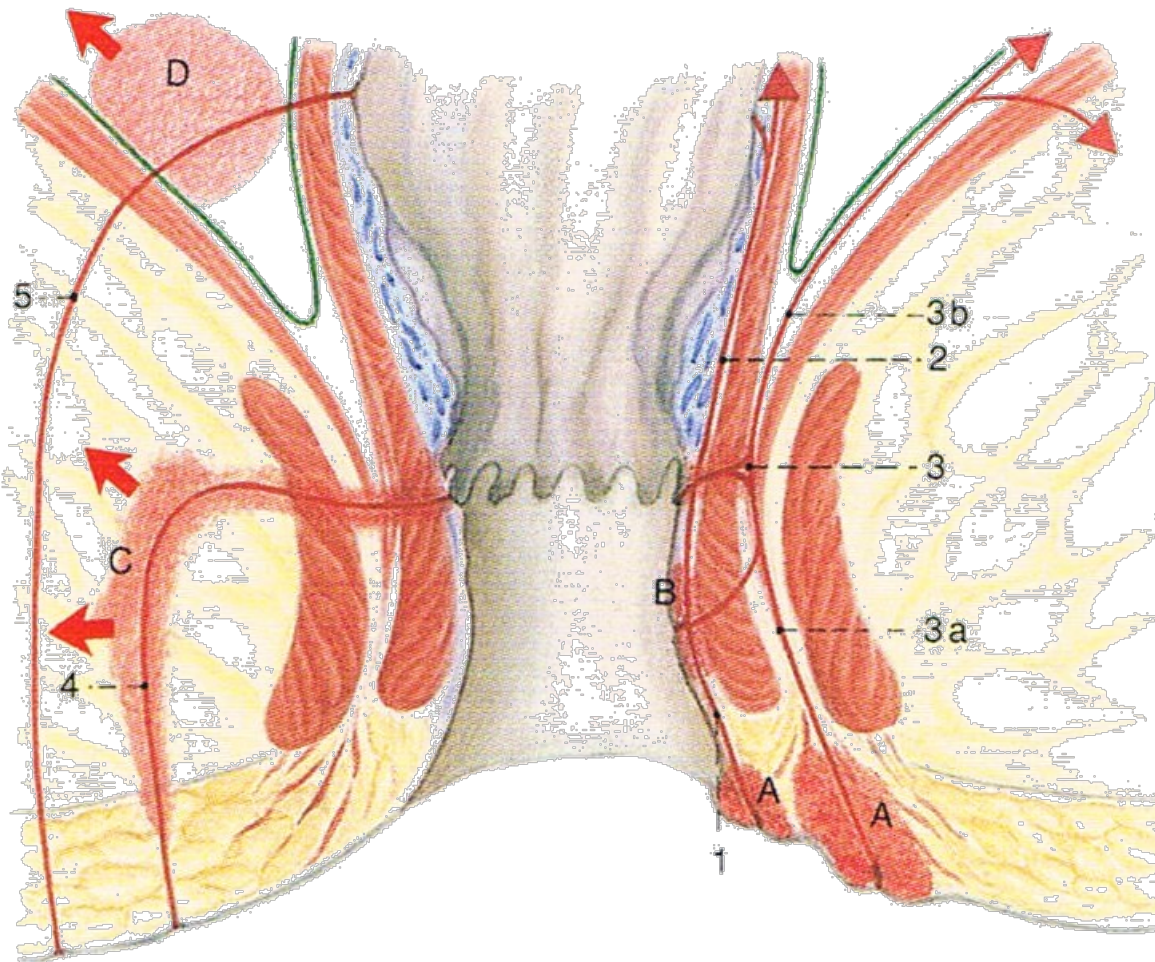
- **Abscess:** acute inflammation
- **Fistula:** chronic inflammation
- **Causes and clinical course**
  - origin of the abscess is usually the proctodeal gland in the intersphincteric space (up to 98%)
  - spread in preformed layers
  - infrequently other causes (CBD, atypical infections)
  - spontaneous regression is no longer possible
  - untreated: perforation (rectum, anal canal, external)



## Perianal /perirectal abscess & Anal fistula (Parks, 1976)

| Type           | Localization                              | Frequency |
|----------------|-------------------------------------------|-----------|
|                | subcutaneously, subanodermal<br>submucous |           |
| <b>I (A)</b>   | intersphincteric                          | 45 %      |
| <b>II (B)</b>  | transsphincteric                          | 30 %      |
| <b>III (C)</b> | suprasphincteric                          | 20 %      |
| <b>IV (D)</b>  | extrasphincteric                          | 5 %       |

# Perianal /perirectal abscess & Anal fistula (Parks, 1976)

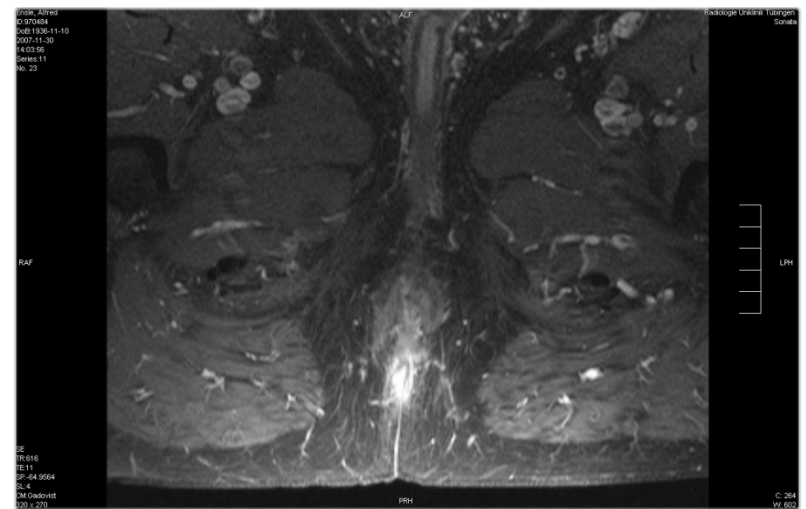
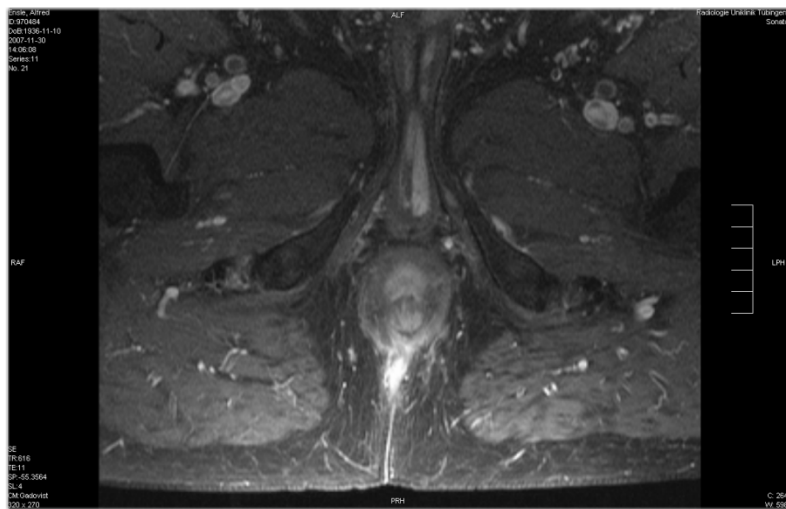
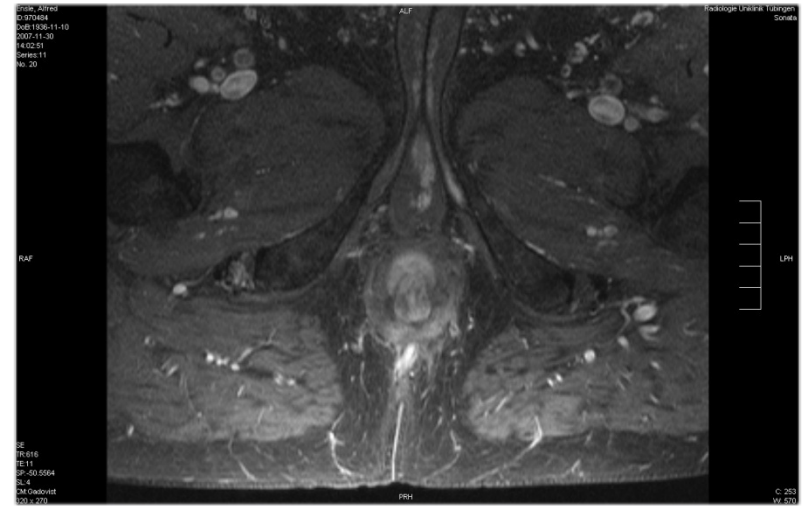
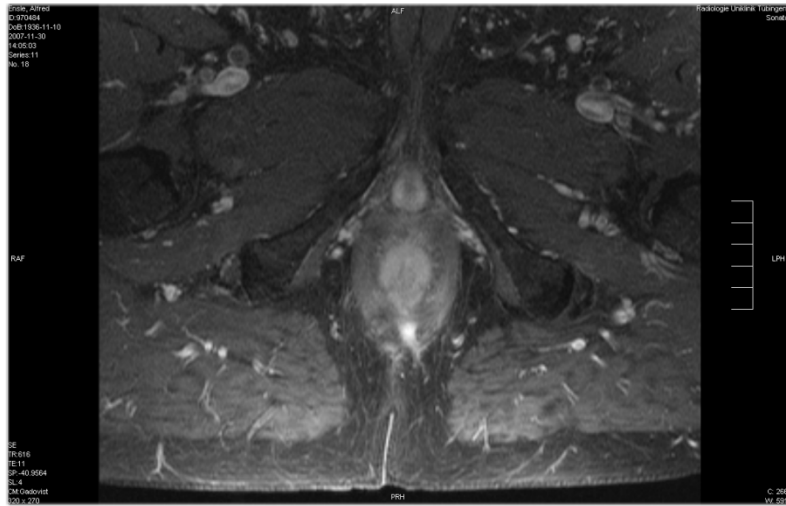


## CASE 3 (Patient: AF, 57 years, ♂ )

- **1 year of non-healing, secreting wound**, external opening (EO) at 2 o'clock lithotomy position (LP),  $\approx$  5 cm from anocutaneous line
- Irrigation through EO -> transanal discharge
- Progredient pain
- **Proctoscopy:** indistinct internal opening (IO)
- Palpable fistula, length  $\approx$  5 cm
- **MRT:** filiform infralevatoric fistula tract at 1 o'clock LP; exclusion of florid inflammation and abscess



# MRI of the pelvic floor - anal fistula





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**MD (AYURVEDA)**

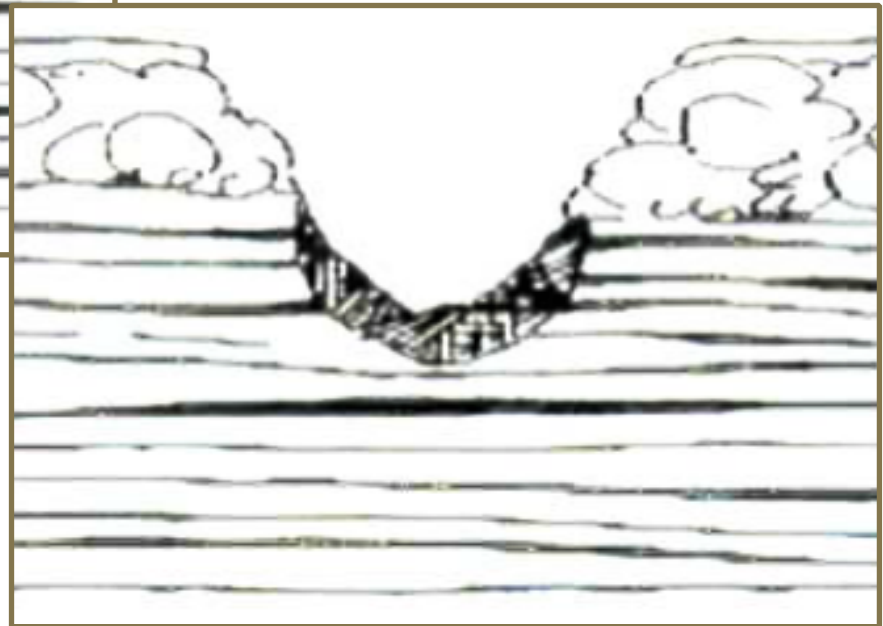
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## Anal fistula - seton (rubber band)

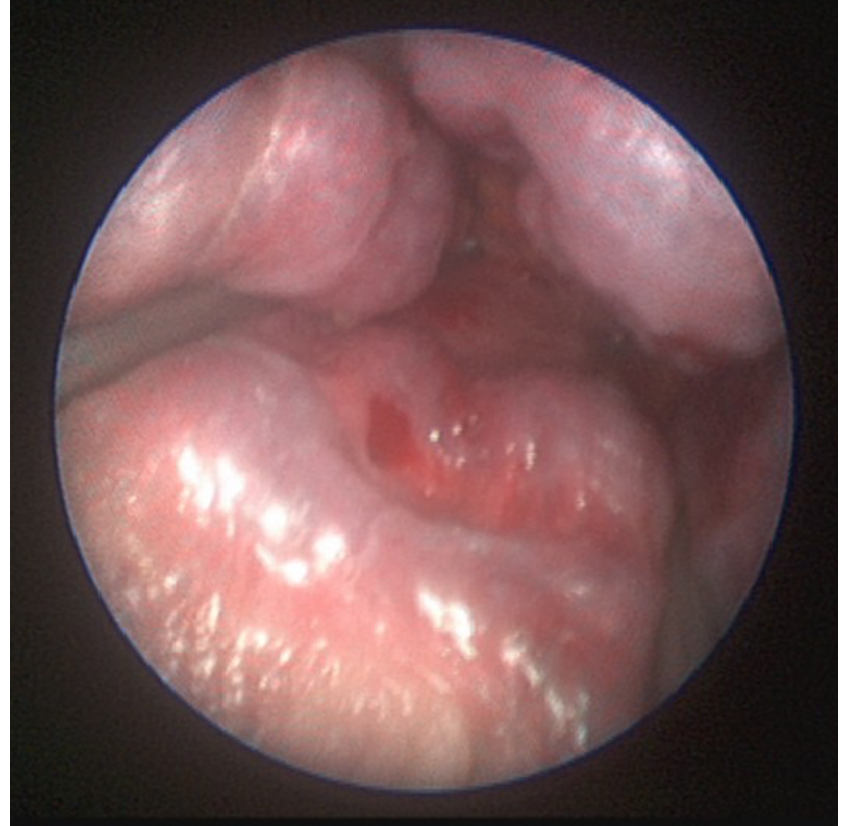




## Anal fistula - Excision of te fistula

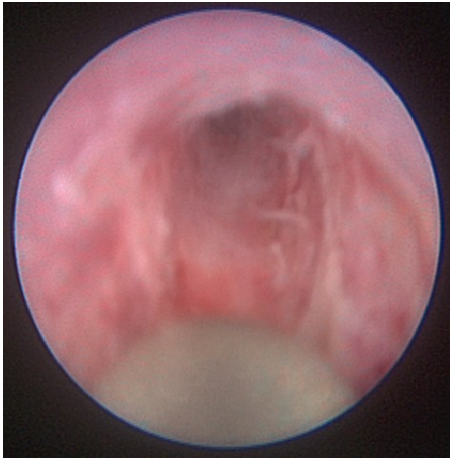


## CASE 3 (Patient: AF, 57 years, ♂ )

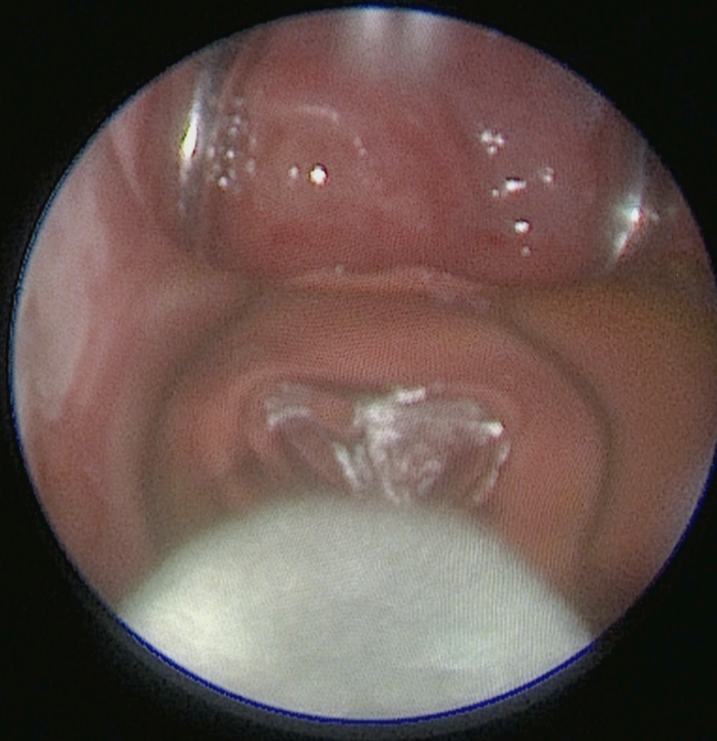


# VAAFT (Video-Assisted Anal Fistula Treatment)

## - MEINERO Technique



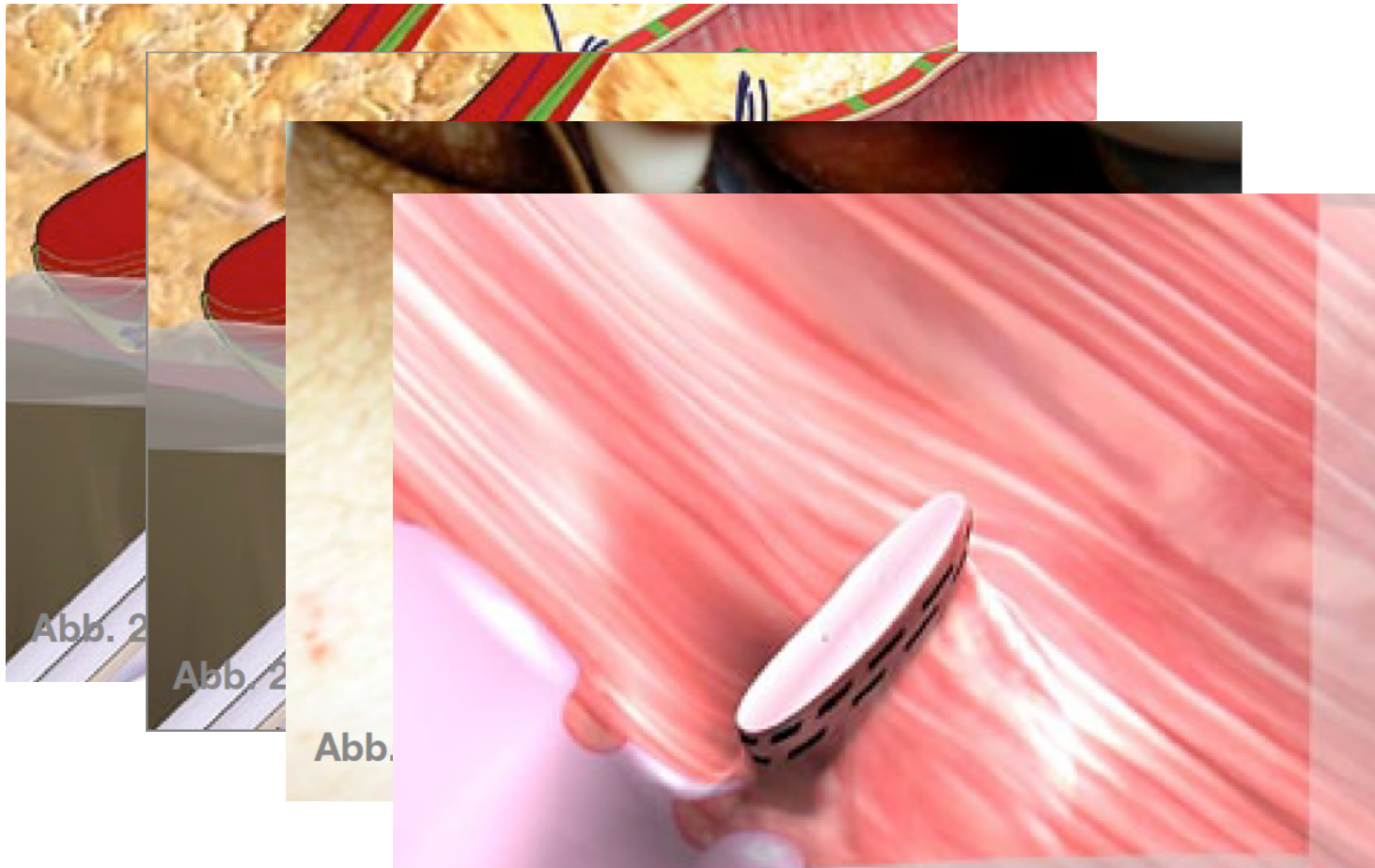




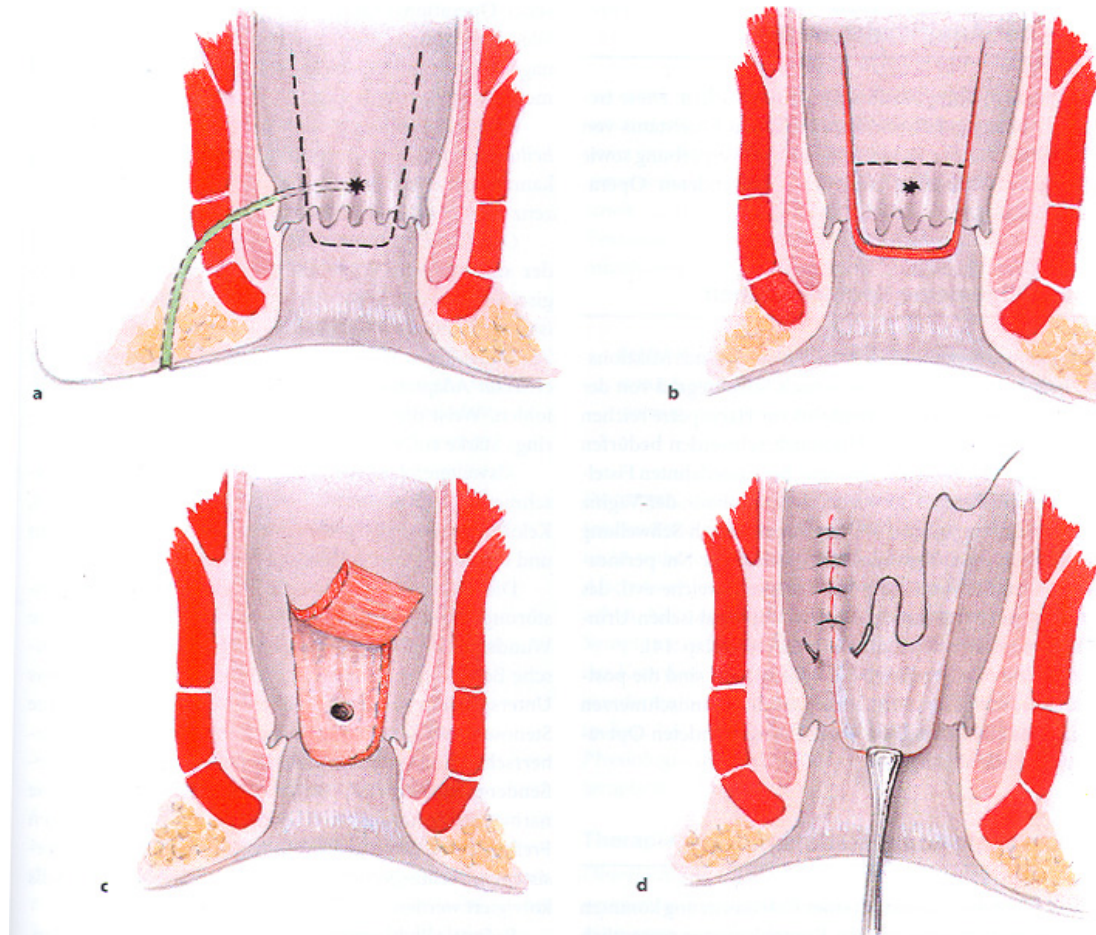
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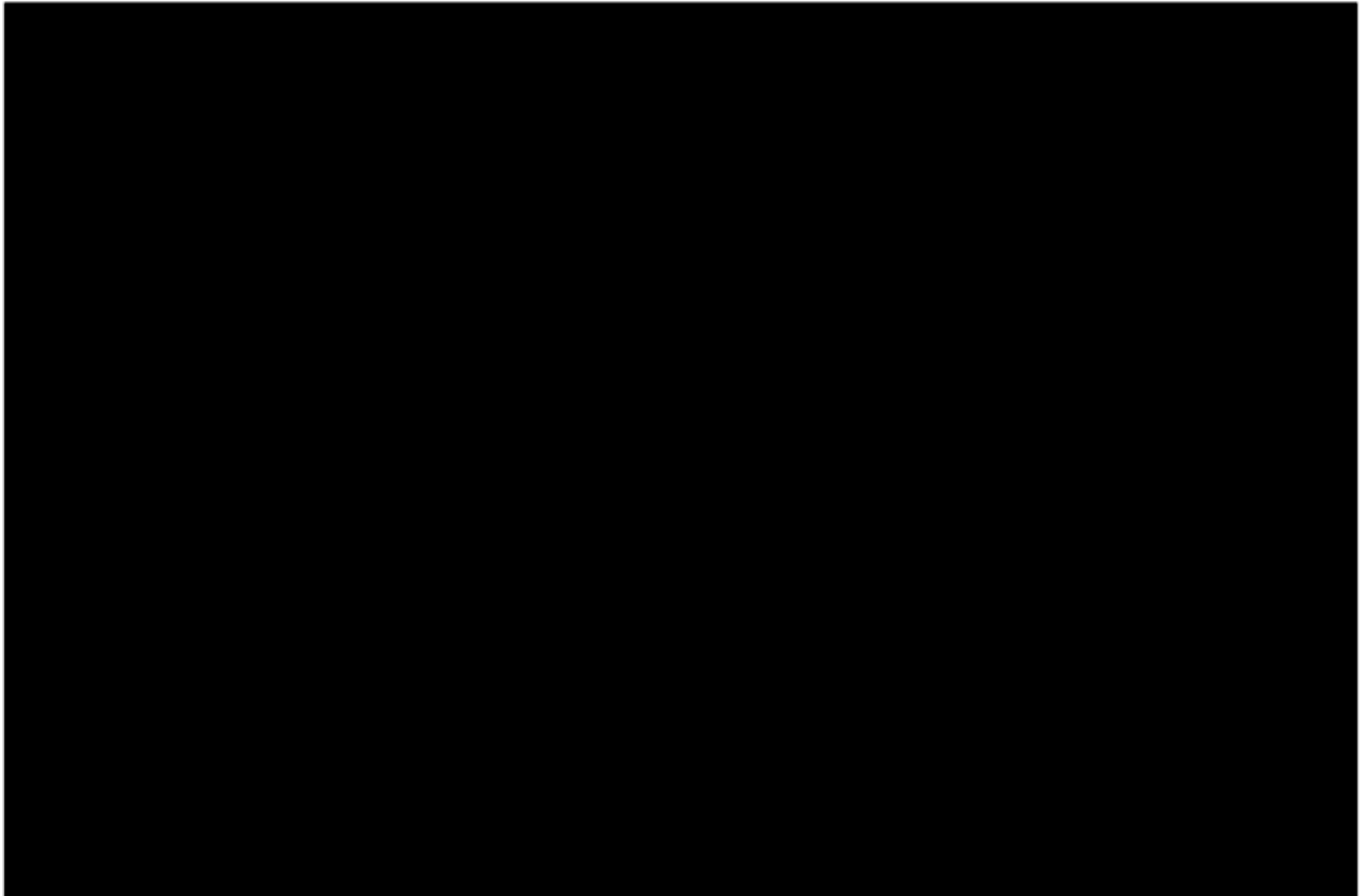
## VAAFT technique - the operative phase



# Anal fistula - rectal advancement flap / mucosal adv. flap







## VAAFT technique - clinical case (A.F., 57 years, ♂)

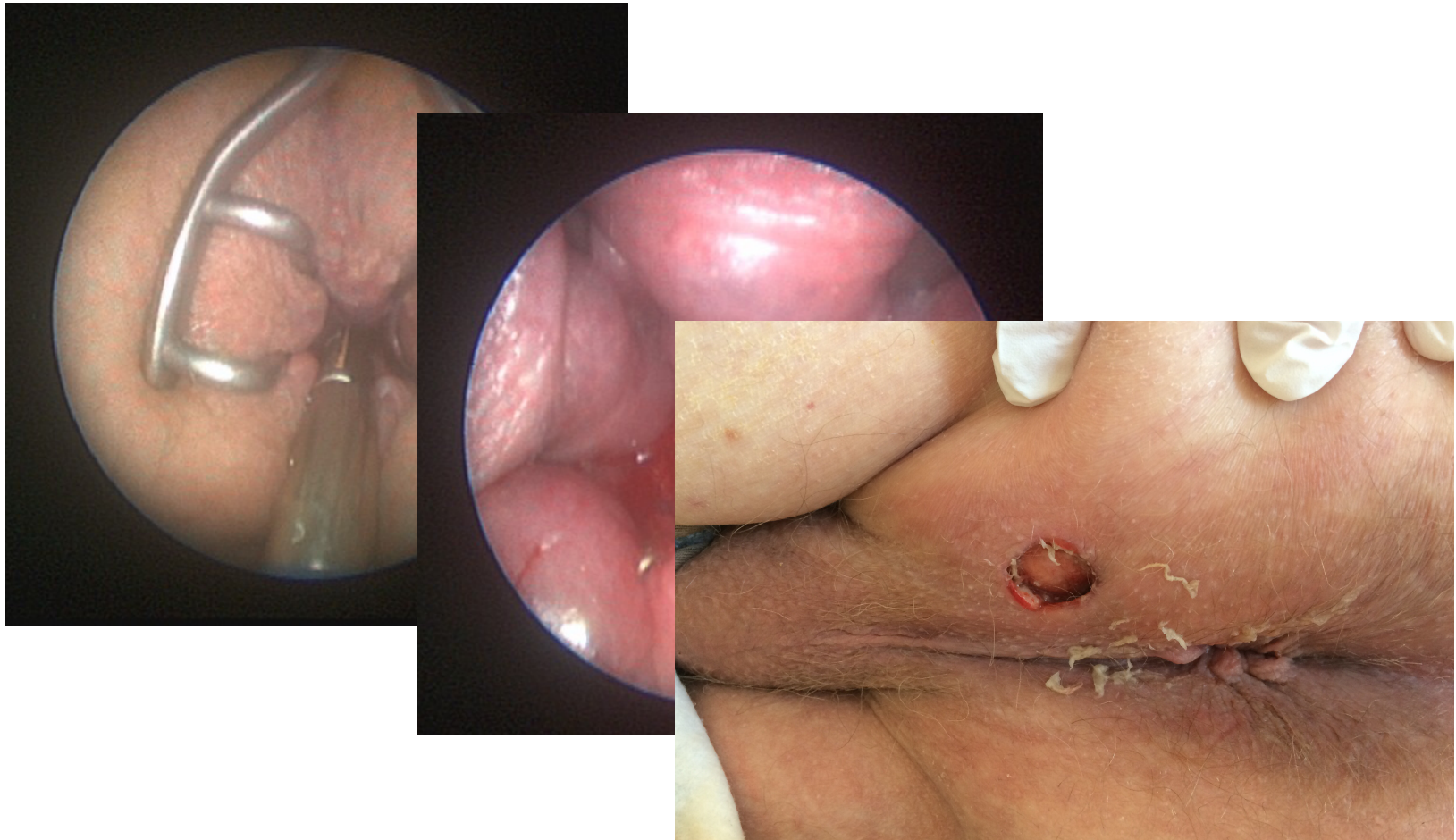


Fig. clinical case: A.F., 57 years, ♂, 11.03.2015

## Summary

- Anatomy of anorectum & pelvic floor
- Physiology & pathophysiology
- available methods of investigation
- clinical cases of coloproctology
  - Haemorrhoids and differential diagnoses
  - Perianal /perirectal abscess & Anal fistula
- individual approach
- technology: support / standardization



