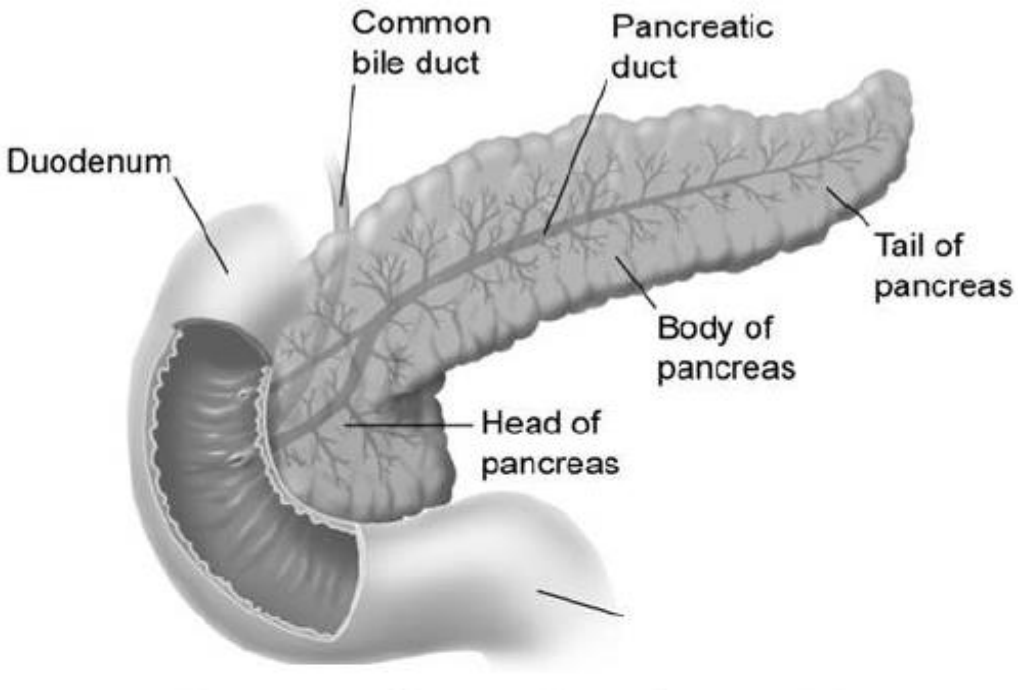


pancreatology, from basics in physiology, diagnostics to therapeutic interventions

Reiner Wiest, M.D.
UVCM, Inselspital Bern

History and milestones in pancreatic pathophysiology

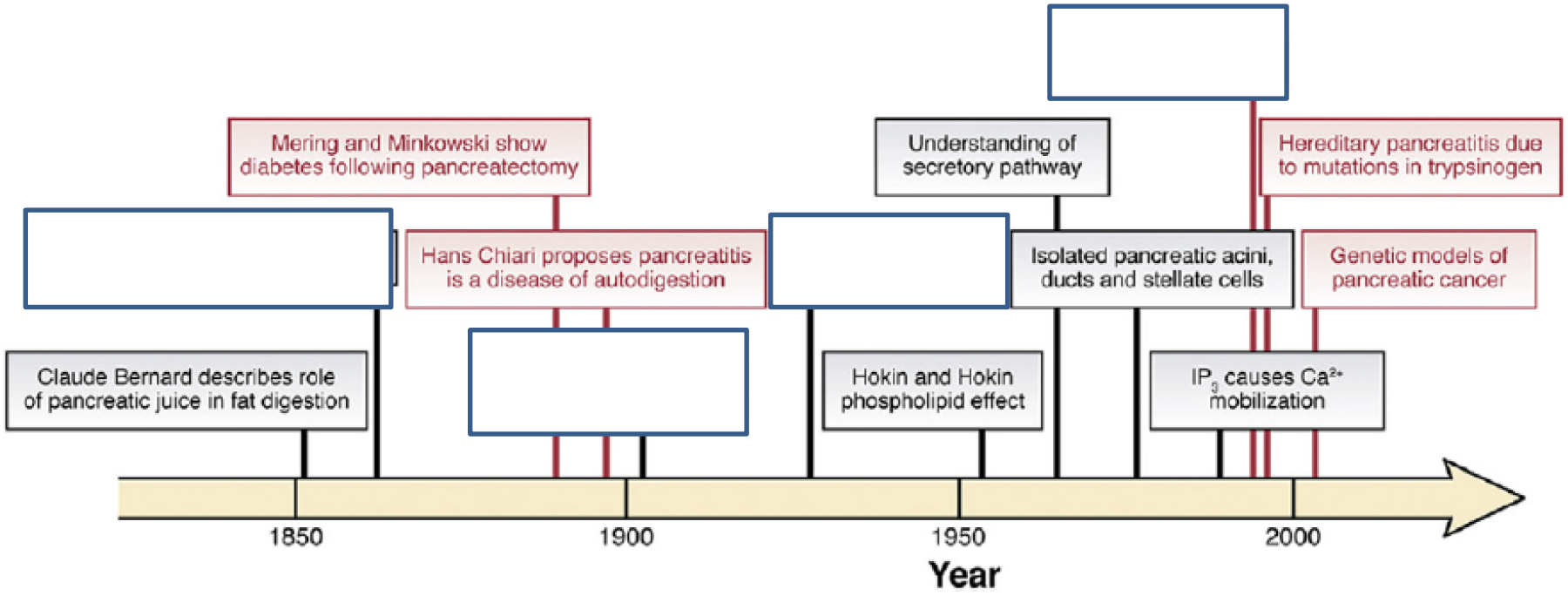
Sort according to timeline

Langerhans → >«islets»

CCK discovered

Bayliss and Starling Discover Secretin

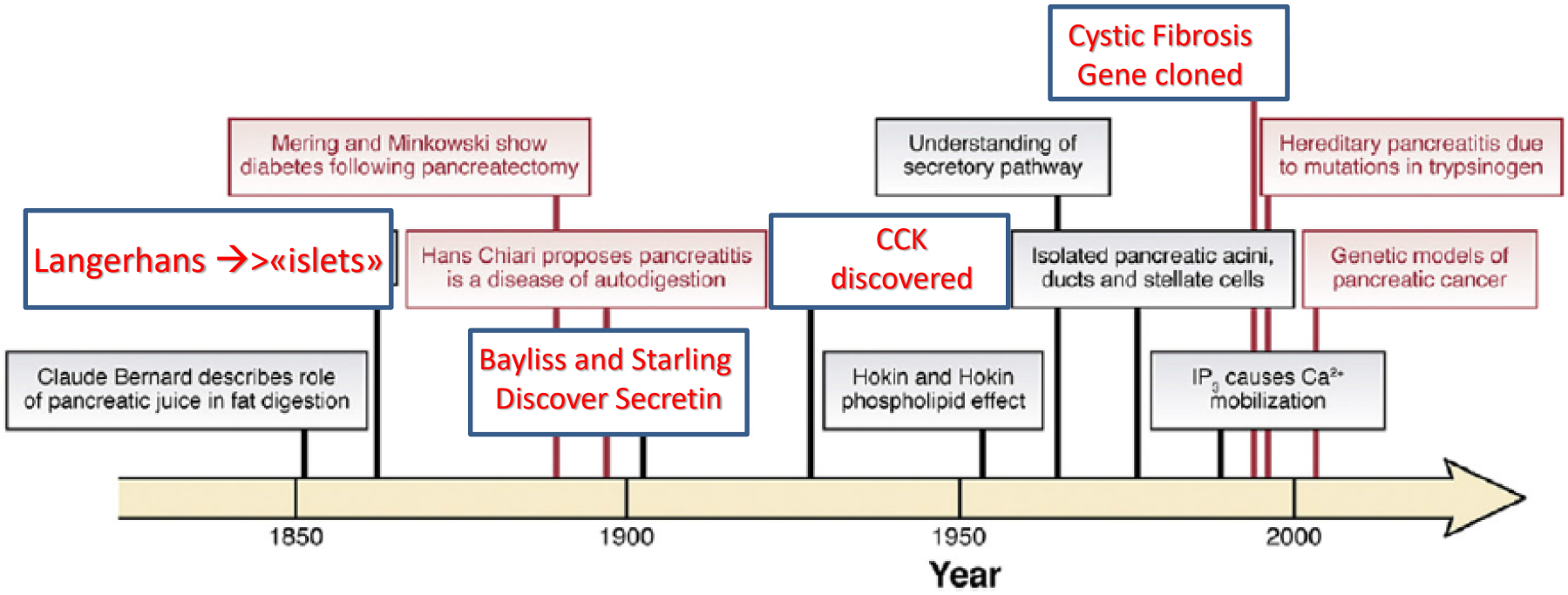
Cystic Fibrosis Gene cloned



Thiruvengadam Muniraj et al. Disease a month 2015

History and milestones in pancreatic pathophysiology

Sort according to timeline



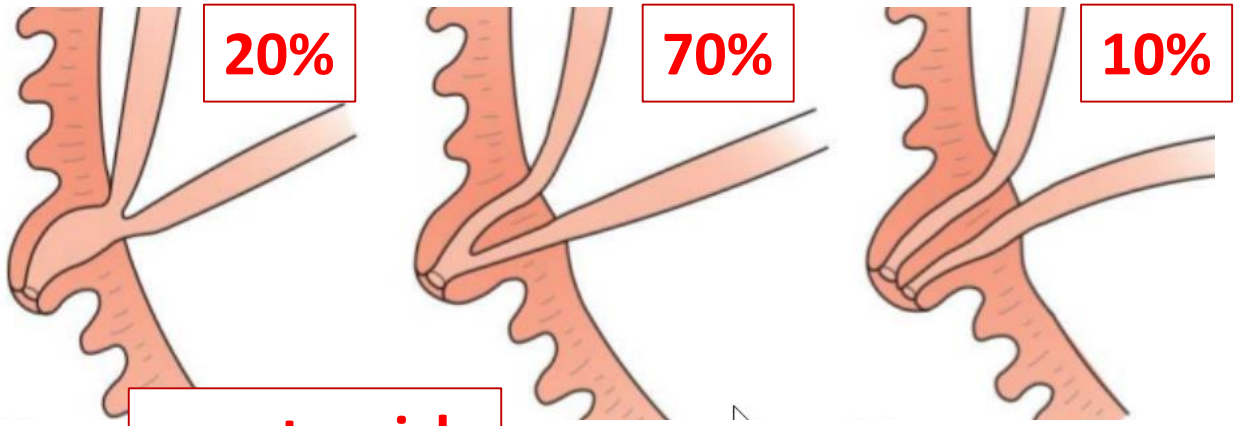
Thiruvengadam Muniraj et al. Disease a month 2015

Anatomy Pancreas

Variations in anatomic relations of bile duct and pancreatic duct

Sort by frequency
present in european population
10%, 20% and 70%

Which has highest risk of Gallstone-pancreatitis ?



Common chanel
Long terminal segi

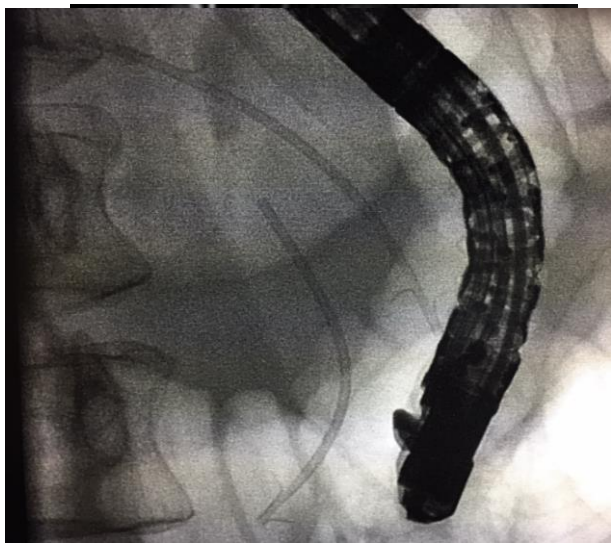
greater risk for gallstone pancreatitis

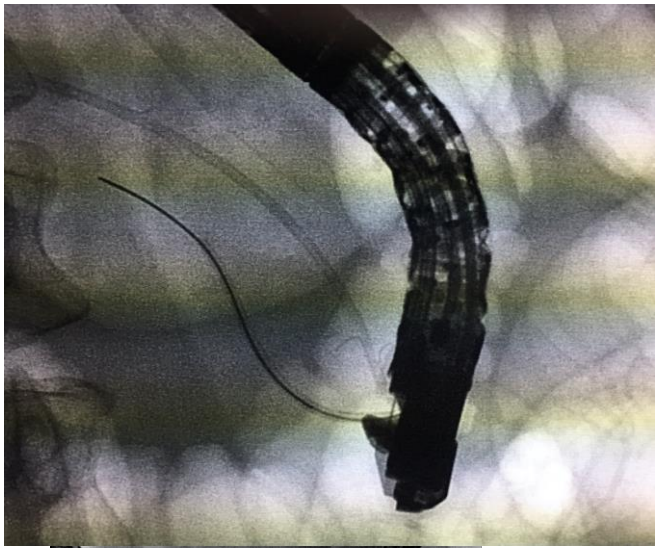
common
inal segment

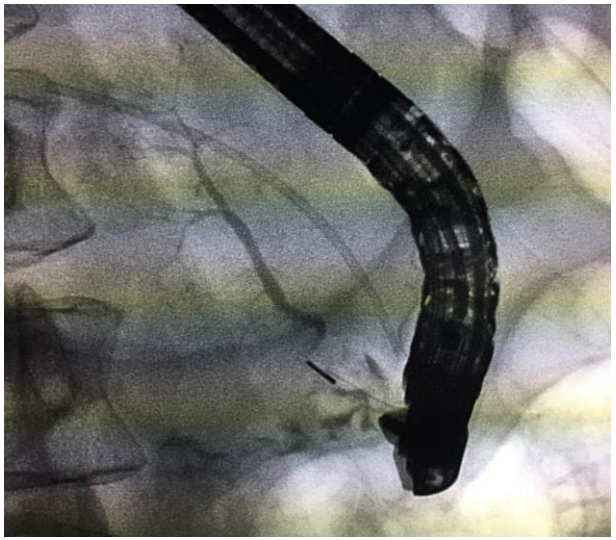
Seperate entry of
CBD and PD into duodenum

What is the diagnosis ?

43 y female, repetitive pancreatitis unknown origin



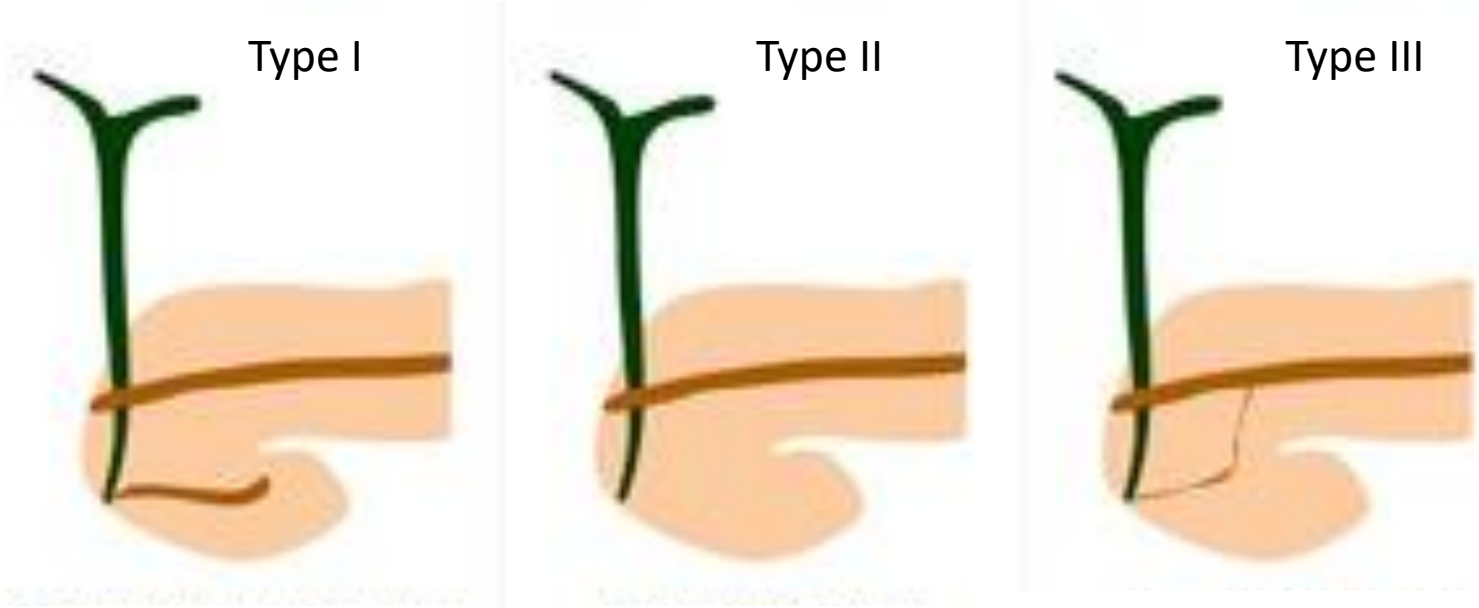




Pancreas divisum

Kaeser-Guenther 23.1.1974

What is a incomplete pancreas divisum ?



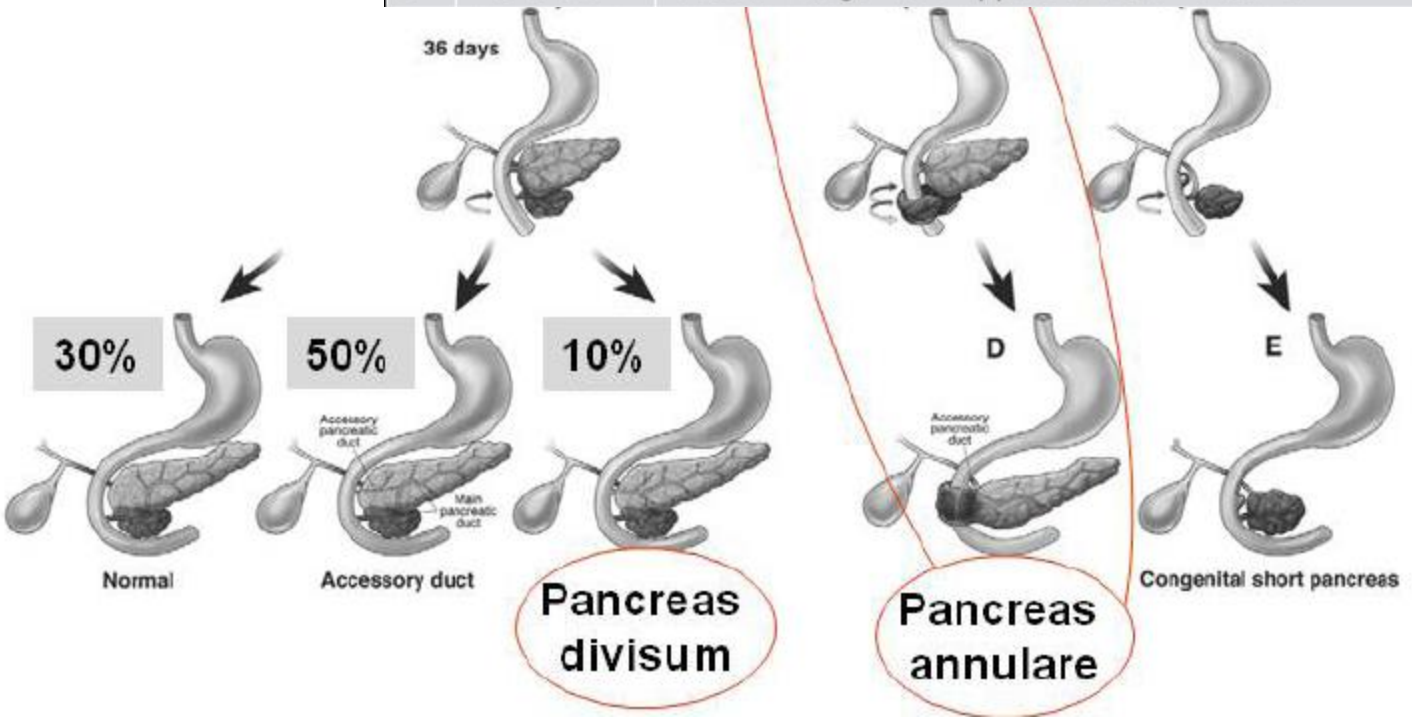
Normal classical

P. divisum with absent ventral duct

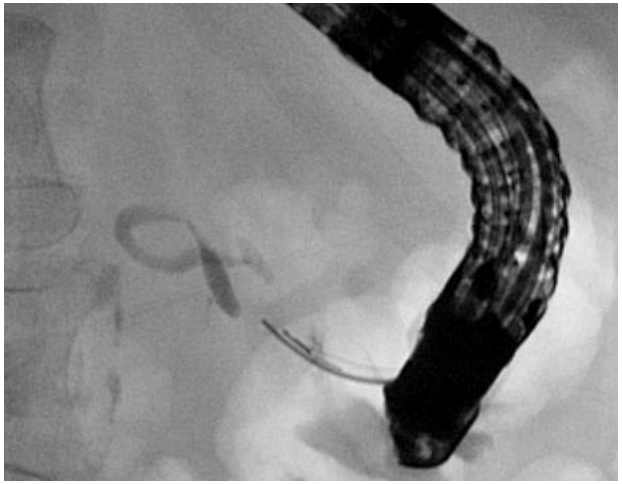
P. divisum with rudimentary Communication between Dorsal and Ventral Duct

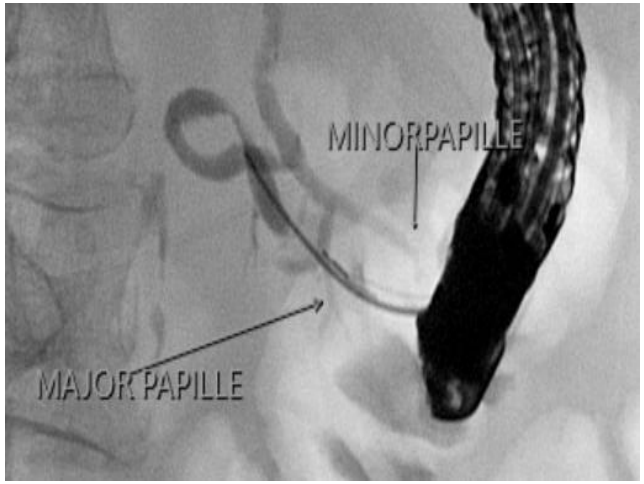
Variants: Pancreas- Embryology

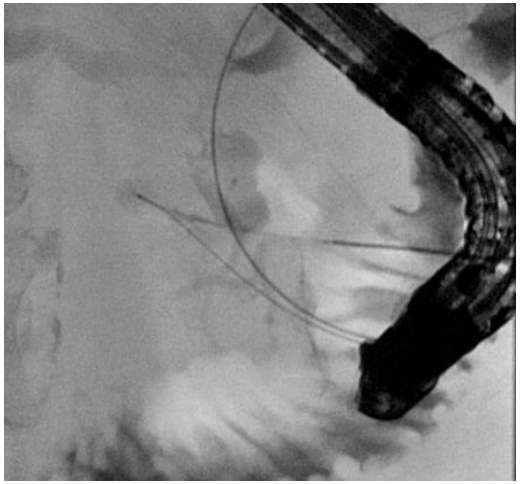
	Time	Event
1	Day 26	Dorsal Pancreatic duct arises from dorsal side of duodenum
2	Day 32	Ventral Bud arises from base of hepatic diverticulum
3	Day 37	Contact occurs between the 2 buds. Fusion by end of 6th week
4	Week 6	Ventral bud produces the head and uncinate process
5	Week 6	Ducts Fuse
6	Week 6	Ventral duct and distal portion of dorsal duct form the main duct
7	Week 6	Proximal duct forms the duct of Santorini
8	Month 3	Acini appear
9	Months 3-4	Islets of Langerhans Appear & become active



«Meandering Loop Main Pancreatic Duct: Rare anomaly – causing pancreatic hypertension ?







CASE REPORT

Meandering Pancreatic Duct as a Cause of Idiopathi Recurrent Pancreatitis

[1]Shyam Sundar, [2]Balaji Purushotham, [3]Rajkumar Rathinasamy, [4]Prabu Kathiresan

4 types of meandering main pancreatic duct

Purushotham et al. World J Lap Surg 2018

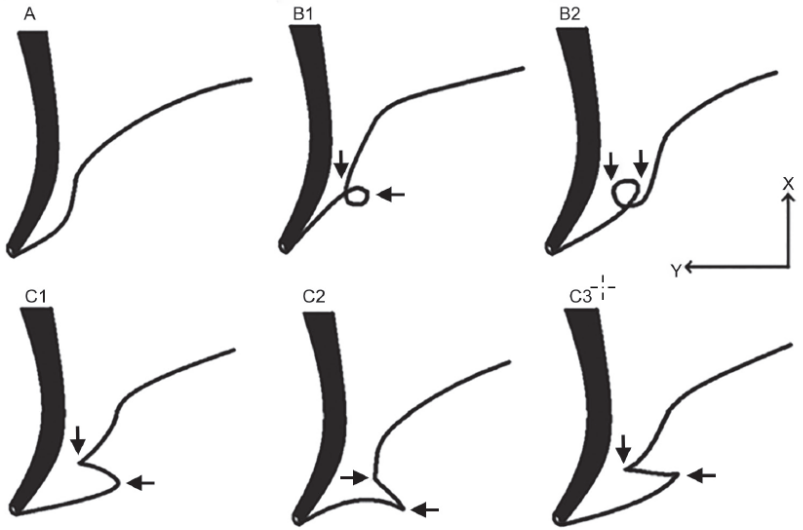
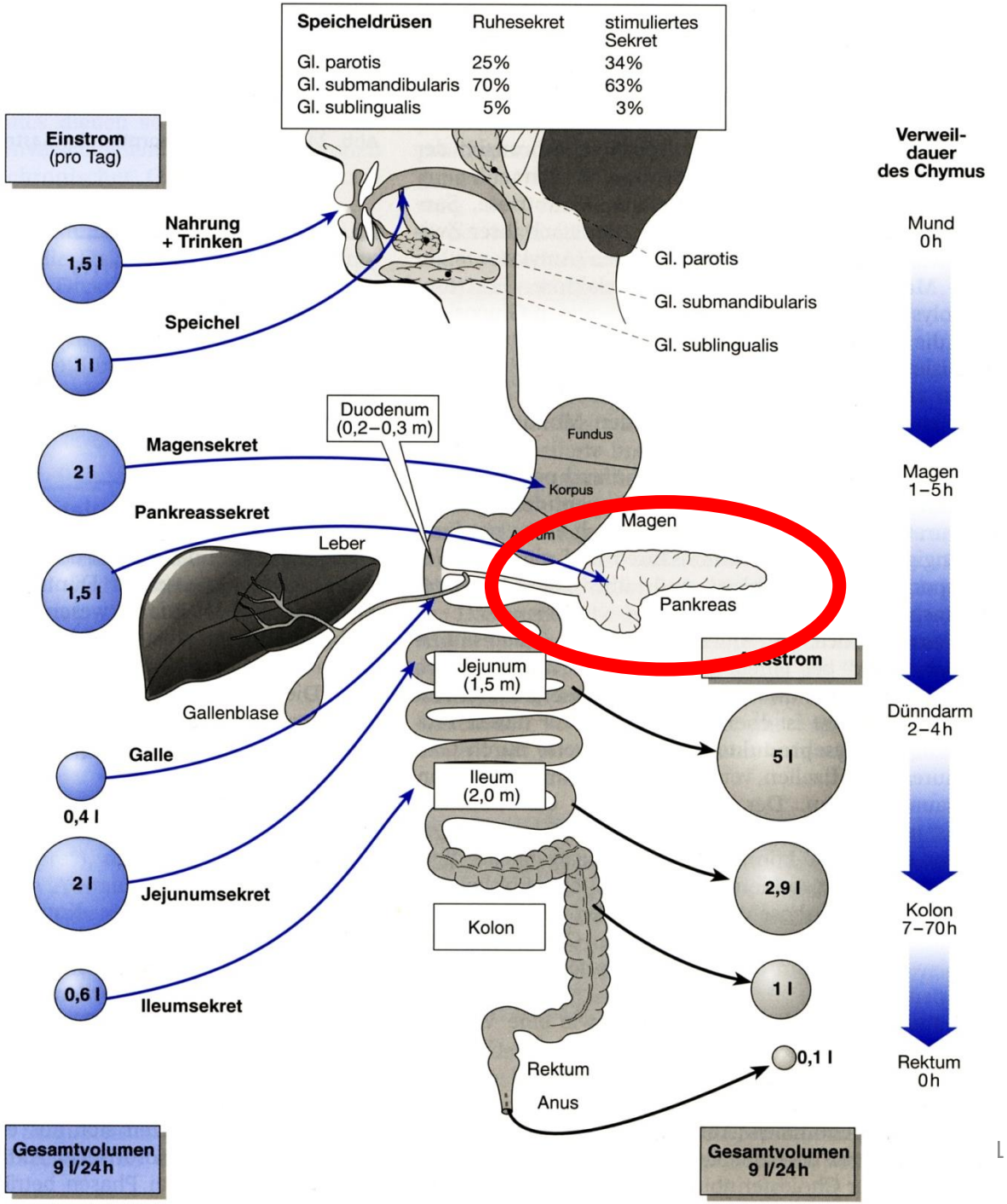


Fig. 4: Types of MMPD

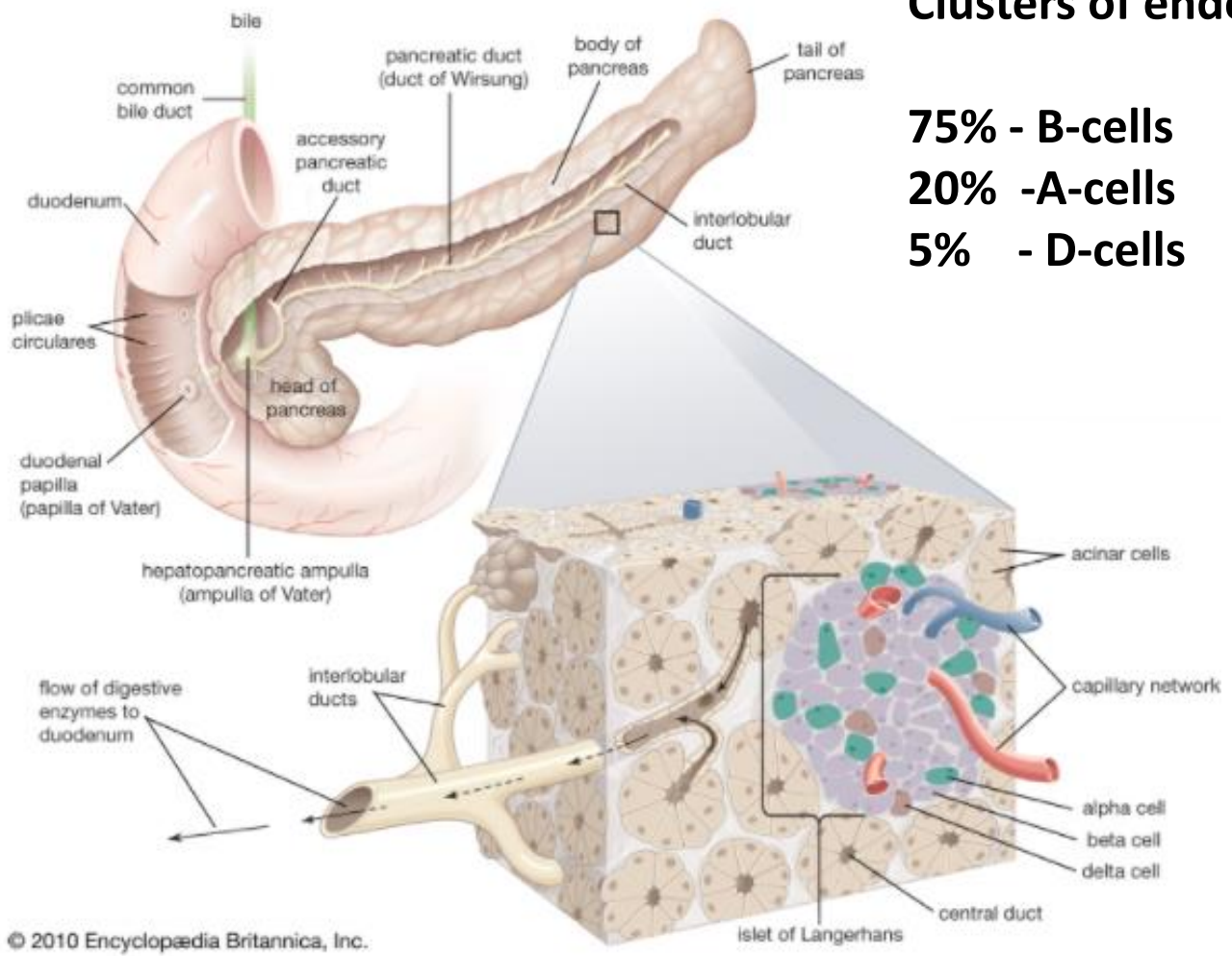
Physiology Pancreas

Overview
Organs involved in Digestion
Secretory Functions

……



Ilset of langerhans:
consists of what cells and produce/secret ?



Clusters of endocrine cells as Islet:

75% - B-cells → Insulin
20% -A-cells → Glucagon
5% - D-cells → Somatostatin

Small number
Panc. polypeptide cells
Capillaries draining islet cells into portal vein

What is released/secreted by the pancreas ?

Organic:
mainly emcymes:
-**α-amylase:** hydrolyses glycogen, starch
-lipolytic encymes: including
lipase:
cholesterol ester hydrolase
phospholipase A2
-**proteolytic** encymes: including
trypsinogen
chymotrypsin
Pro-Carboxypeptidase A+B
Ribonuclease
Deoxy-ribonuclease
Pro-Elastase
-**Trypsin-Inhibitor**

Hormones
Insulin
Glucagon
Somatostatin

Inorganic:
Mainly Electrolytes

-cations:
Na+,K+,Ca2+,Mg2+,Zn2+

-anions:
HCO3-, Cl- (traces HPO42-)

Composition: 99.5% water, 0.05% solids

Which stimulus for what pancreatic secretion ?

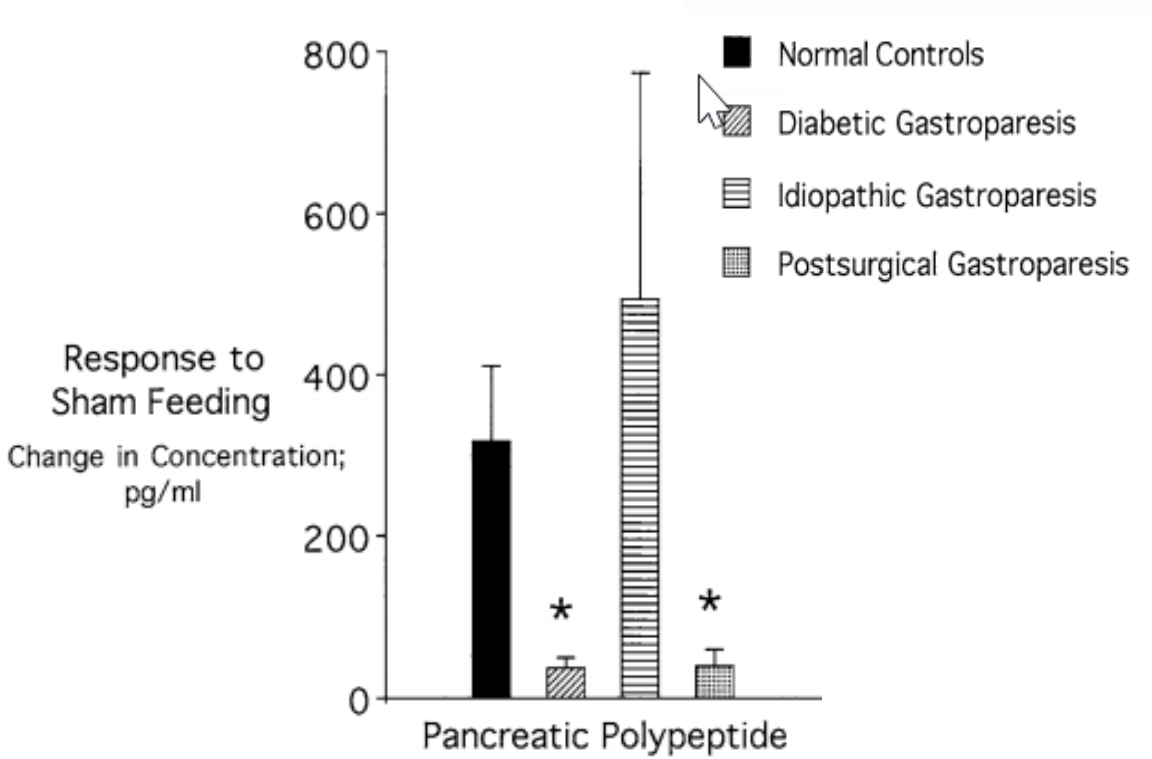
	Stimulus	Mediator	Pancreatic Response
Cephalic Phase	Conditioned reflex taste smell, thought of food Unconditioned reflex by taste of food in mouth	**Vagus**	little secretion pancreatic encyme, e.g. PP and HCO3-
Gastric Phase	Distension of stomach Amino acids + Peptides	**Vagus** **Gastric secretion: Gastrin…**	little secretion pancreatic encyme, Low volume high conc.secretion Large secretion with high HCO3
Intestinale Phase	Low pH chyme, in duodenum, AA, >C8-FA,MG.. Stimulates S-cells…….	**Vagus** **Cholezystokinin-Pankreozymin and Secretin**	Full pancreatic encyme response Large secretion with high HCO3

How to test vagal function: on pancreas ?

See and smell
toasted bacon + cheese + bread

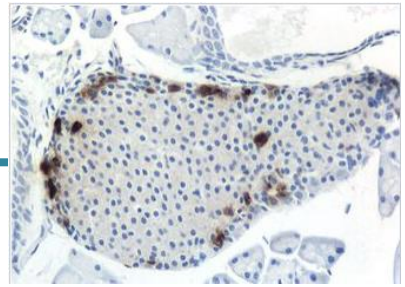
after 5 minutes
Chewing half portion
Spitting each bite
on napkin

Blood samples
5,10,15 – till 30 min
after initiation of exposure
Analysis for PP



Gaddipati et al. Dig Dis Sci 2006

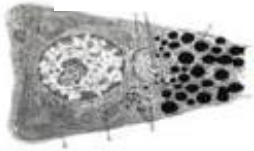
Pancreatic Polypeptide……



- **is synthesised and secreted by PP cells (also known as gamma cells or F cells) of the pancreatic islets**
- **stimulates migratory motor complex (synergistic with motilin)**
- **affects hepatic glycogen levels and many gastrointestinal secretions (e.g. stimulates gastric acid)**
- **decreases food intake**
- **……**

Physiology of pancreatic encymes: activation

- **Synthesis as active encyme: amylase, lipase, RNAs, DNAse**
- **Proteolytic encyms: synthesis as in-active pro-encyme (zymogens)**



Centro-acinary zymogengranula-secretion: **Trypsinogen**

ENTERO-KINASE = membranständige Protease in der Dünndarmmucosa aktiviert **Trypsinogen** im **Darm**lumen

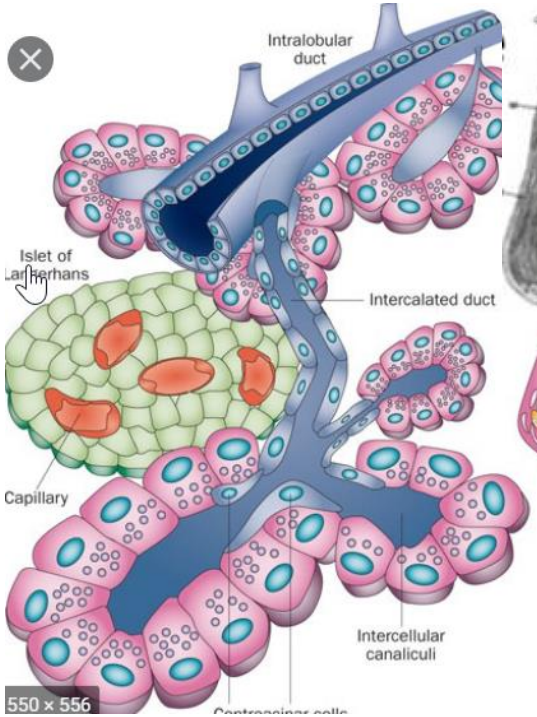
Trypsin + Trypsin-Aktivierungkomplex

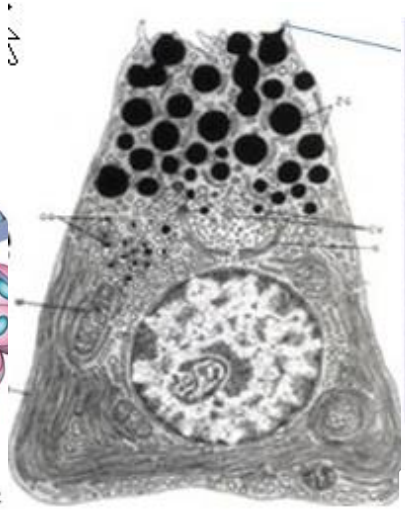
Autoaktivierung von **Trypsin(ogen)**

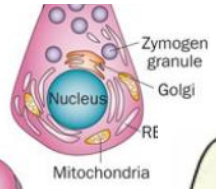
- **Chymotrypsin**(ogen)
- Pro-**Elastase**
- Pro-**Carboxypeptidase**
- Pro-**Phospholipase**

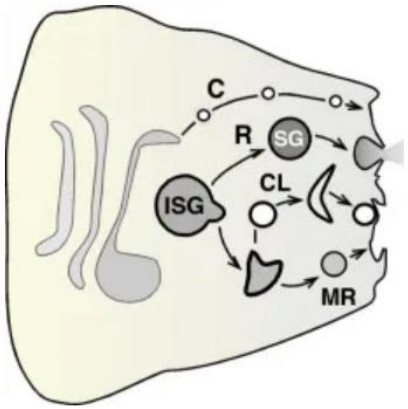
- **Trypsin**

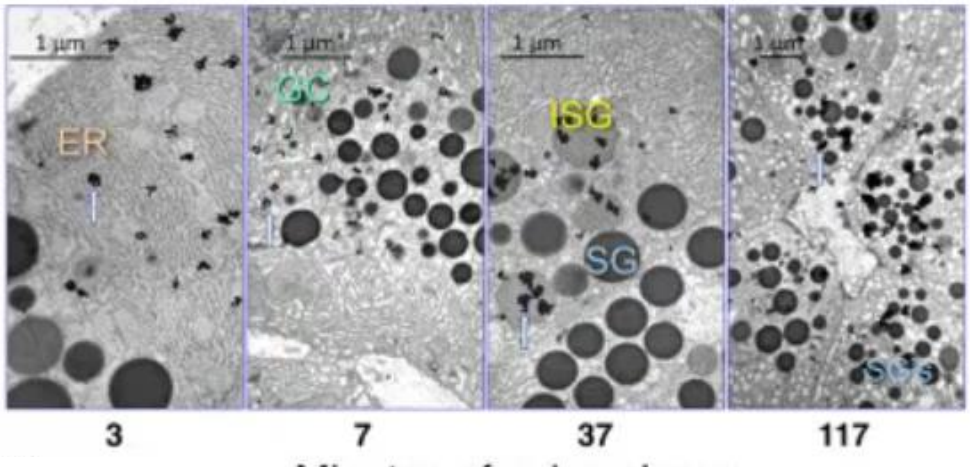
Acinus/cell: ?

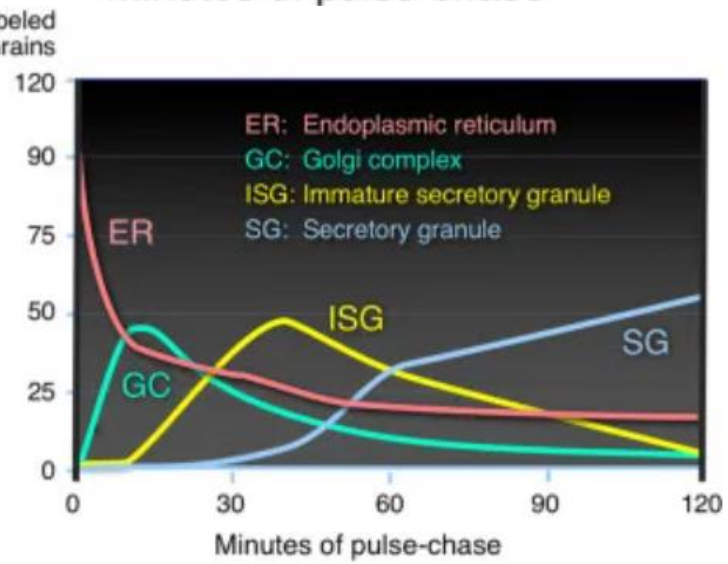












Synthesis of all
main digestive encymes
Produced as pro-encymes =
stable storage apical part
Protection from autodigestion by:

Zymogen-granula = vaculoa with membran
Seperating trypsinogen from lysosomal encymes
Ca-concentration cytosolic tightly regulated
low Ca-level protects from premature activation

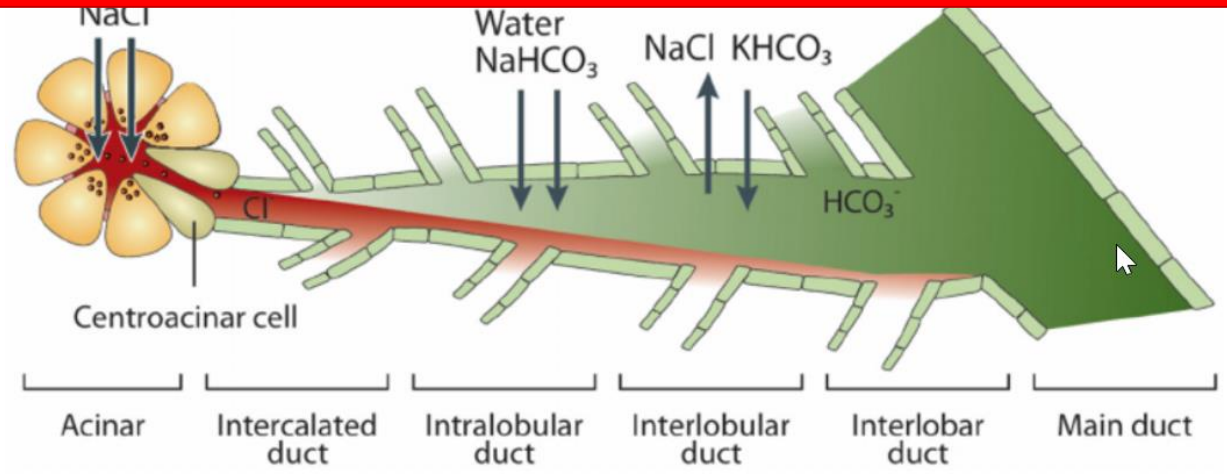
Intra- and Inter-lobular duct cell secretion……..

Secretion by acinar cells is isotonic, resembles plasma

Secretion by intralobular ductal cells has high conc. of K^+ and $HCO3^-$

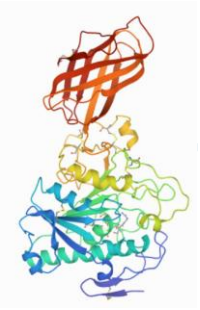
Secretion by extralobular ductal cells is stumulated by secretin, rich in $HCO3^-$

Secretion
water and bikarbonat (1.5-3 L/d), pH 8
for transport of encymes and neutralisation of gastric acid



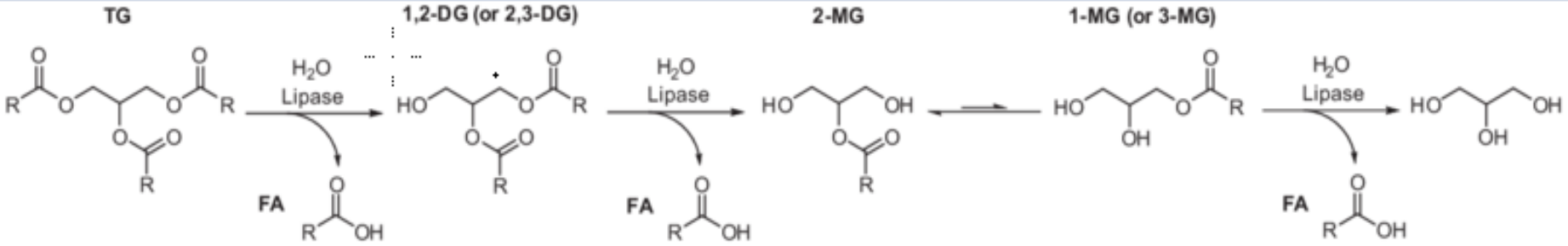
$HCO3^-$ directly proportional as rate increases conc increases from 80-120meq/L with Cl^- inversely proportional

How is pancreatic lipase acting ?



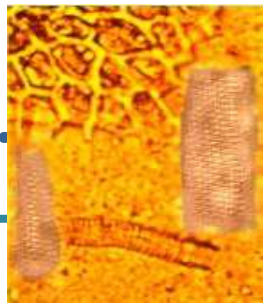
Hydrolases neutral fats to glycerol esters and fatty acids

Is secreted in its final active form but requires colipase in the presence of bile acides thus only in the duodenum (with bile being secreted)
Absorption of resulting FA and MG requires bile salts micelles



Lipase requires high pH for its activation among food encymes
= reason why fat are the hardest of all foods to be digested

Total Removal of Pancreas results in …



Endocrine deficiency of insulin-> Diabetes mellitus

Exocrine Insufficiency with development of digestive disturbances:

- ✓ **Steatorrhoe**

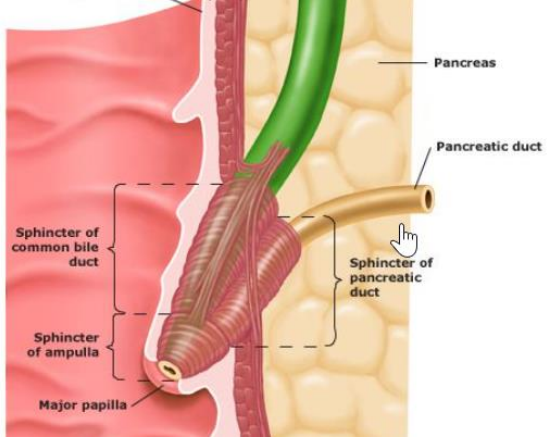
Increase in faecal fats: bulky, foul smelling, pale, greasy

> 7g Fett/d at 100 fat-intake/day

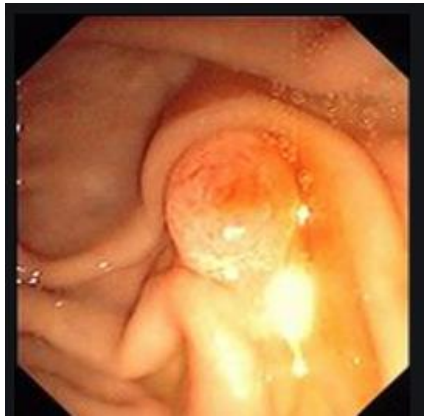
- ✓ **Increase in faecal nitrogen due to incomplete proteolysis**
- ✓ **Carbohydrate digestion relatively unchanged**
- ✓ **Loss of about 30% of caloric value of normal diet/ingested food**

Diagnostic Work-Up

Anamnestic inquiry
Genetic testing
Autoimmune pancreatitis
acute pancreatitis: severity, scores, markers
Exocrine pancreatic function



What is Nardi-Test when is it positive = SOD ?



provocation-test with morphine to induce sphincteric spasm and prostigmine to stimulate pancreatic exocrine secretions

Positive as sign for SOD

Elevation of lipase of at least by a factor of four –times normal

coupled with reproduction of the patient's pain

Anamnestic inquiry

Etiology factors linked to acute pancreatitis

Gall stones

Ethanol

Trauma

Steroids

Mumps

Autoimmune

Scorpion venom

Hyper-lipid, -ca

ERCP (5%)

Drugs

GET-SMASHED

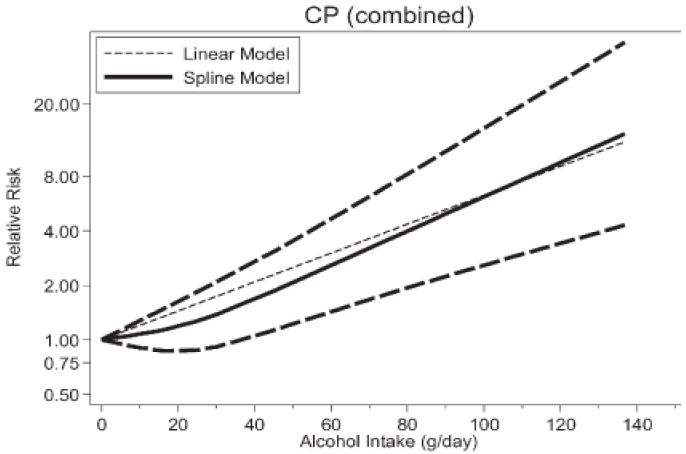
Anamnestic inquiry

alcohol and pancreatitis risk

Threshold below which no risk ?

NO

Dose-response- relationship ?



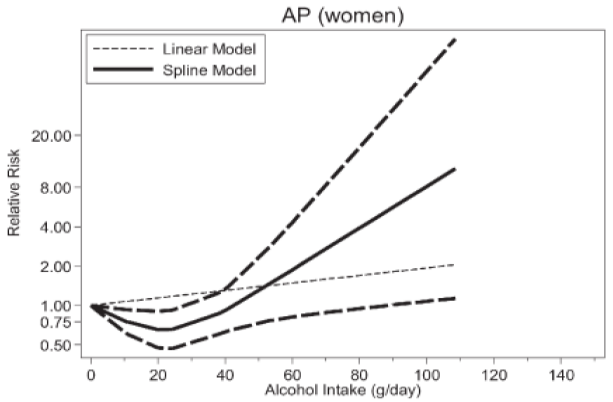


Fig. 4. Pooled dose–response risk relationships between average alcohol consumption and acute pancreatitis in women.

Risk for chronic pancreatitis in heavy drinker (>80g/day for > 10 years) ?

About 5%

Anamnestic inquiry

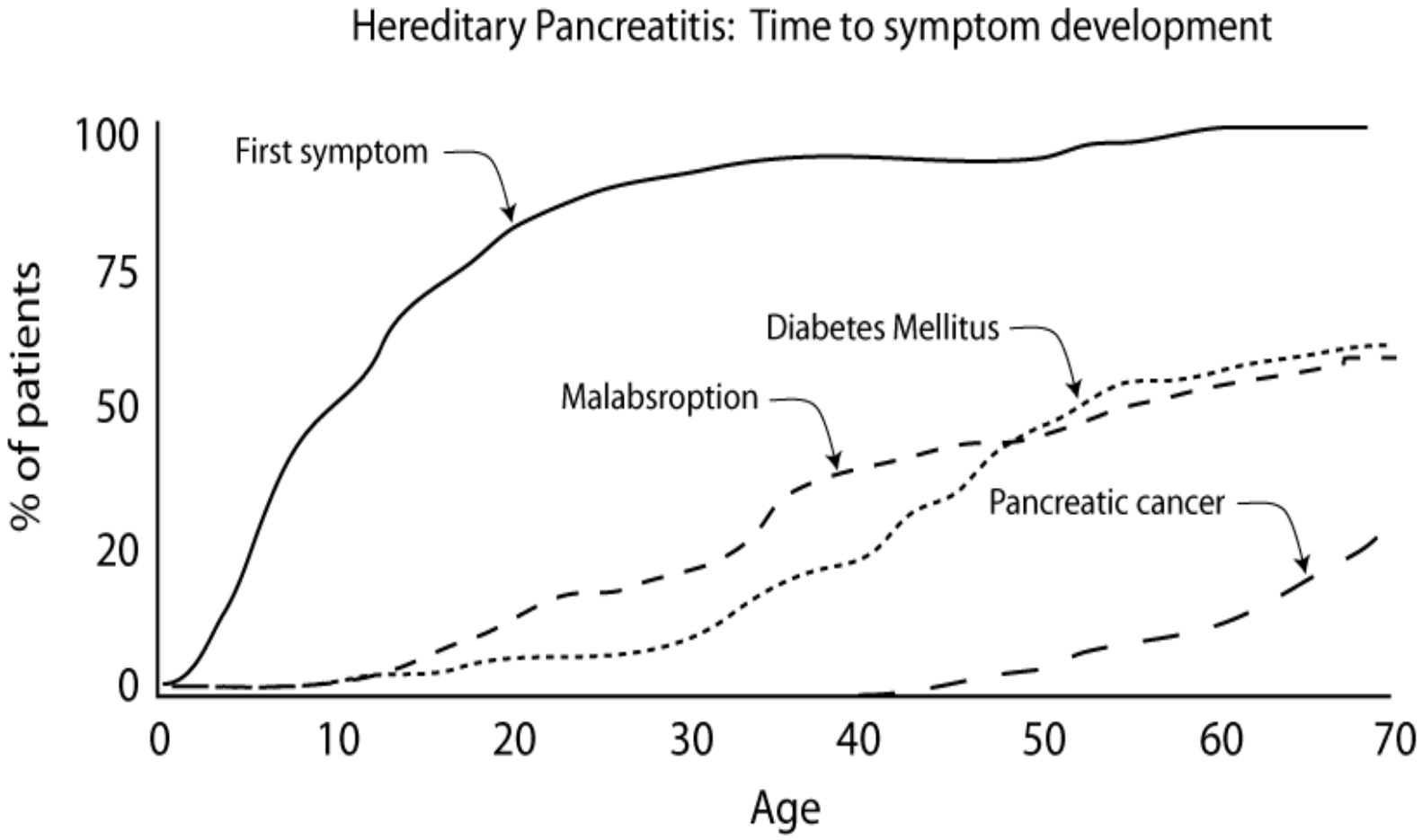
C2 + Nikotin und Pankreatitis

	Alcohol consumption (g/month)			
	<400		≥400	
	RR† (95% CI)	p Value	RR (95% CI	
Smoking status*				
Never	1 (Ref)			
Former	1.30 (0.88 to 1.9			0.02
Current	1.63 (1.1			<0.01
Pack-years of				
N			1 (Ref)	
	.06)	0.20	1.97 (0.91 to 4.24)	0.08
	0.81 to 2.55)	0.21	3.96 (1.87 to 8.39)	<0.01
<20	1.69 (0.99 to 2.90)	0.06	2.13 (0.84 to 5.40)	0.11
≥20	1.94 (1.18 to 3.19)	<0.01	4.12 (1.98 to 8.60)	<0.01

After two decades of smoking cessation risk of non-gallstone-related acute pancreatitis is reduced to a level comparable to that of never smokers

Gut 2012 O-Sadr

Natural History of hereditary pancreatitis



Howes et al. Clin Gastroenterol Hepatol. 2004;2(3):252-61

Risk of pancreatic cancer in HP ?

- **standardized incidence ratio 50-87**
- **cumulative risk until age 70: 40%**
- **low below age 50**
- **needs decades after first clinical presentation**
- **smoking doubles risk –occurence about 20 years earlier**
- **diabetes add-on risk factor**

Number of first and second degree relatives with CA
e.g. two first degree – life time risk about 8 %

Genetic testing ?
When – whom to consider ?

Before performing molecular analysis- genetic counseling

Consider genetic testing for HP when

- **Family history of idiopathic CP, recurrent pancreatitis or**
- **Childhood pancreatitis (or < 25 years in age**

  with recurrent acute pancreatitis or CP)

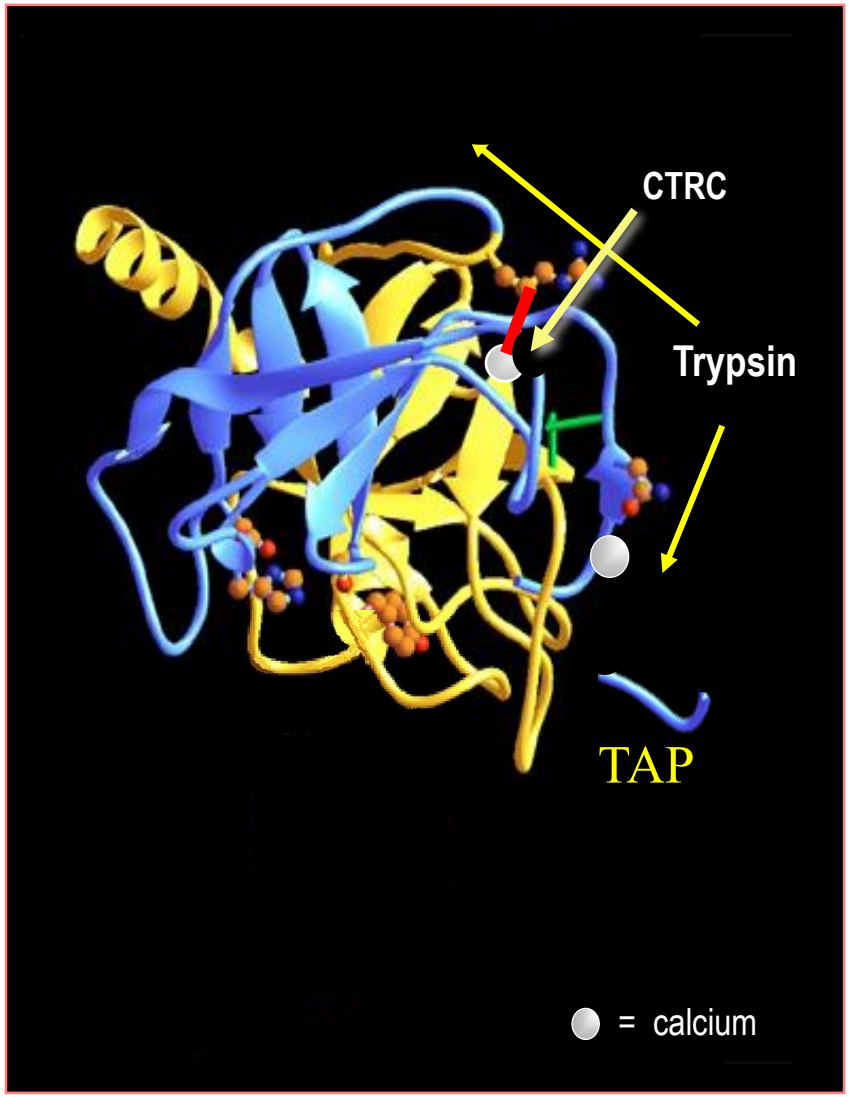
  without explanation after extensive work-up
- **Relatives with known mutations associated with HP**

Trypsin(ogen) Regulation

Trypsin(ogen)

- The **master** enzyme controlling all other digestive enzymes
- Trypsinogen controlled by:
  - **Trypsin(2) Calcium(2)**
  - **SPINK1**

Modified from Whitcomb, Hereditary and Childhood Disorders of the Pancreas, Including Cystic Fibrosis. Sleisenger and Fordtran's Gastrointestinal and Liver Diseases, 7th Edition, 2002



What you know about SPINK1 ?

SPINK1 is an acute phase protein and specific trypsin inhibitor

Few SPINK1-mutations directly associated with HP: autosomal-recessive

One SPINK1-mutation (c.27delC) inherited autosomal dominant

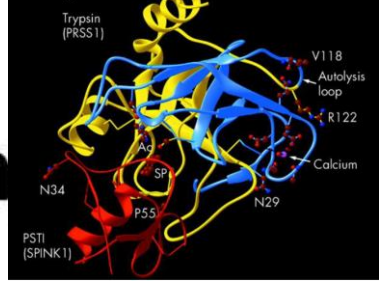
Majority inherited in heterocygous form

Phenotypic expression of pancreatitis requires interactions with

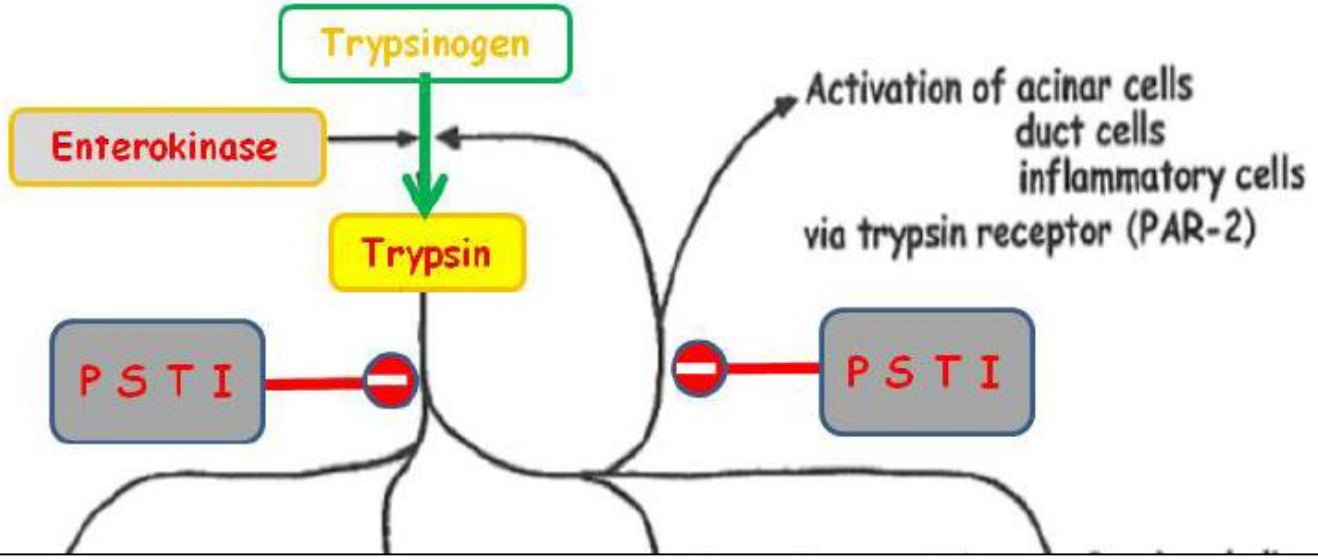
Other genetic mutations and/or environmental factors

= *disease-modifying mutations*

Mutations in SPINK1 in HP



- **PSTI** Pancreatic Secretory Trypsin-Inhibitor
  - Serin-Protease-Inhibitor, Kazal-Typ 1: **SPINK1**



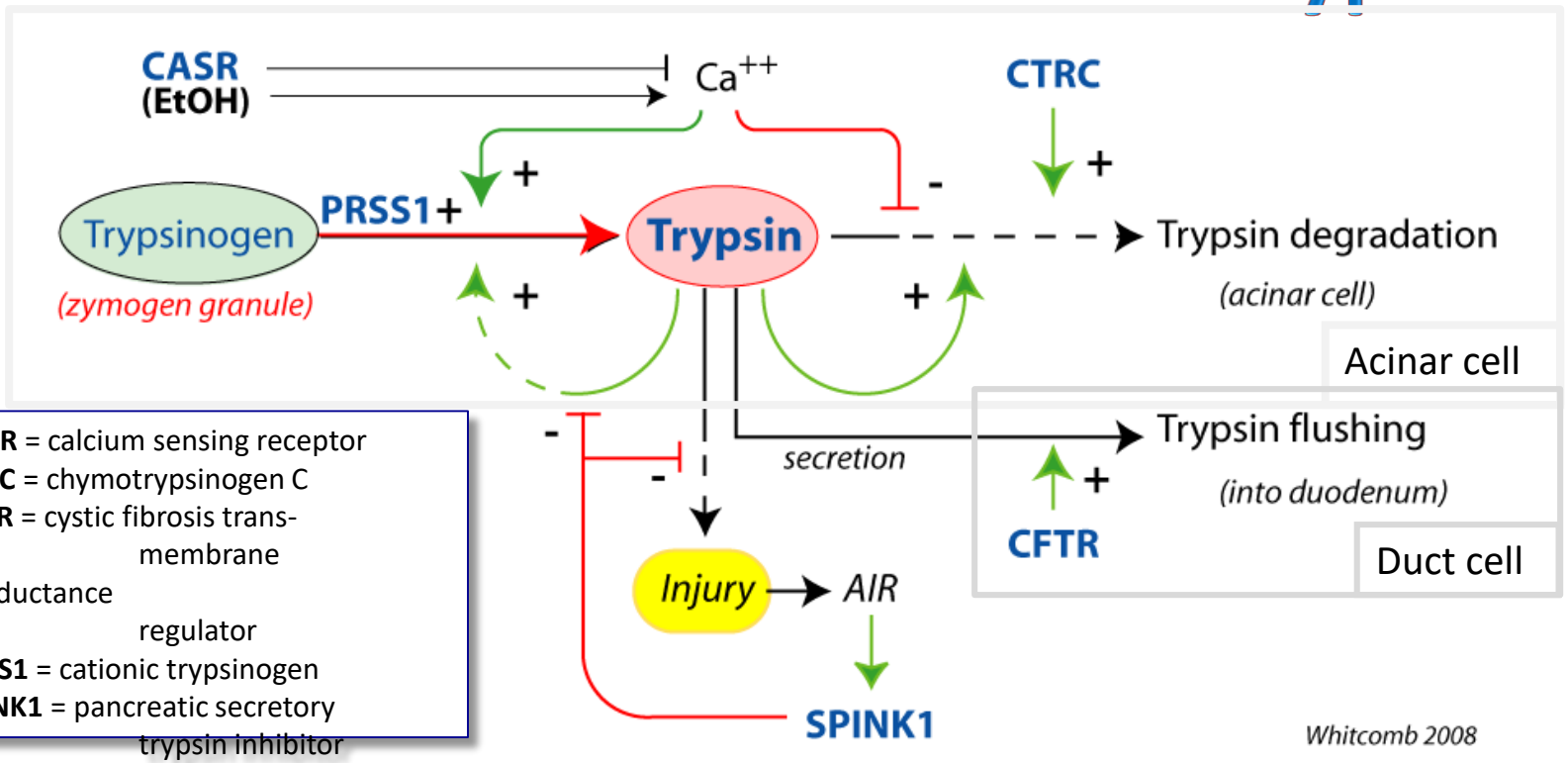
In pancreas: inhibits up to 20% of trypsinogen
e.g. mutation: L14R in 2 european large families:
rapid intracellular degradation of the mutant protein=
abolished secretion of SPINK1

Which genes- when mutated affect risk for HP ?

Gene	Common name	Risk Pa-Cancer (CI)
PRSS1	Hereditary pancreatitis	SIR 53 (23-105)
STK11/LKB1	Peutz-Jeghers-Syndrome	RR 132 (44-261
CDKN2A	Fam. Atyp. MMM syndrome	RR 13-39
MLH1, MSH2, MSH6	Lynch-syndrome	RR 8 (6-11)
TP53	Li-Fraumani-Syndrome	RR 7 (2-19)
BRCA1	Hereditary breast/ovarian Ca	RR 2 (1.2-4)

- **CTRC: Chymotrypsinogen-C**
- **CFTR: cystic fibrosis transmembrane conductance regulator**
- **Calcium-sensing receptor Gene**
- **Claudin-2 (CLDN2)**
- **Carboxypeptidase A1 (CPA1)**

Genetic Variants Related to Trypsin



CASR = calcium sensing receptor
CTRC = chymotrypsinogen C
CFTR = cystic fibrosis trans-membrane conductance regulator
PRSS1 = cationic trypsinogen
SPINK1 = pancreatic secretory trypsin inhibitor

AIR = Acute inflammatory response (acute phase protein expression)

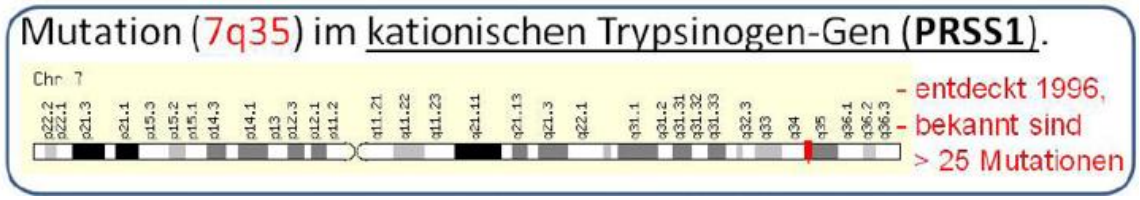
- Genes linked to **CP susceptibility** all regulate intra-pancreatic **trypsin** activity.
- Both the acinar cells and duct cells are linked with pancreatitis-causing variations

Whitcomb DC. *Annu Rev Med*. 2010;61:413-24.

PRSS-associated hereditary pancreatitis: progression and CA?

autosomal dominant

penetrance 80%



+FA: Pancreatitis attacks from childhood on

Progression to chronic pancreatitis

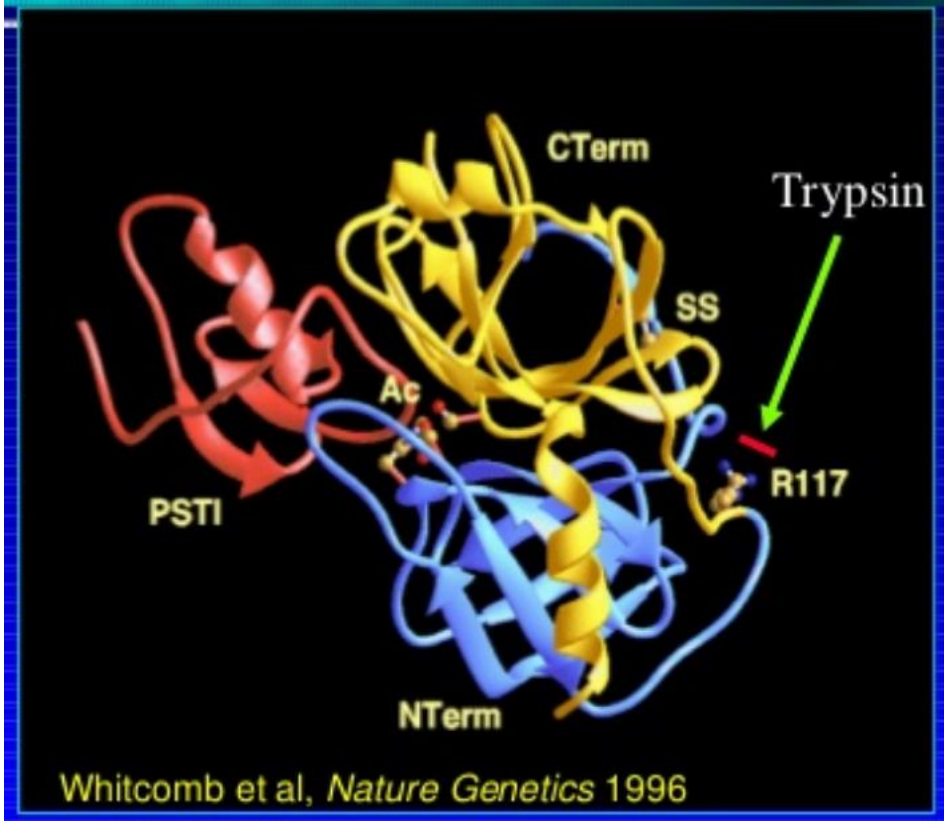
forcified by alcohol and nicotin

Risk for pancreatic cancer:

50j: 10% at age 75: 50%

Most frequent mutation (Arg122His) with defect Arg117: Resistent for proteolytic trypsin-degradation

PRSS-induced HP is casued by «Super-Trypsin»

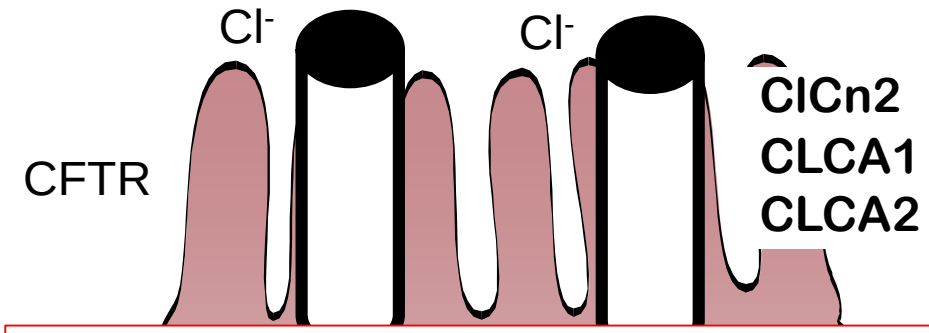


Active trypsin in the pancreas will cause the pancreas to digest itself.

Normally, the pancreas is protected because active trypsin will destroy itself by cutting at R117. This will split the trypsin and inactivate it.

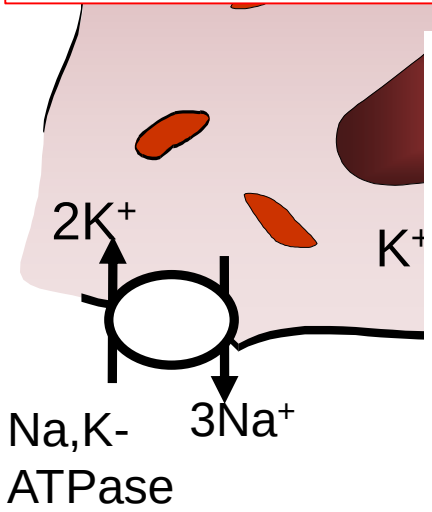
In HP, R117 is mutated to H117. This creates a "super-trypsin" that cannot be inactivated and leads to acute pancreatitis.

Pathophysiology cystic fibrosis ?



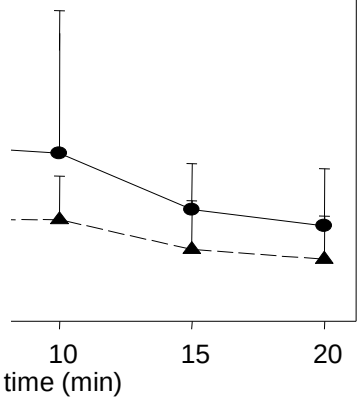
- Mutation CFTR Chlorid-Chanel
- Disturbed secretion of Chlorid-Ions
- and hence, viscous secretion
- Prevalenz 1:2500, heterozygot: 1:25

CFTR in pancreas = primary molecule in bicarbonate conductance



WINK1/SPAK activation changes CFTR from a chloride- to a bicarbonate-preferring channel

NKCC1



Two types of autoimmune pancreatitis

	Typ I (LPSP) Lymphoplasm. Scleros. Pancreatitis	Typ II (IDCP) Idiopath.ductocentr. Pancreatitis
Epidemiology *Age* *Gender*	Ca. 60% of AIPs M:W = 3:1 6th decade	Ca. 40 % of AIPs M:W = 1:1 4./5th decade
Clinic *Extrapancreatic involvment* *Association with IBD*	Jaundice 75% Acute Pancreatitis 5% YES Weak	Jaundice 50% Acute Pancreatitis 33% NO Strong CED (v.a. CU) association (10-20%)
Treatment *Response*	**95-100%**	**90-100%**
Prognosis *Relapse Rate*	Up to 60%	<10%

Serology in AIP ?

Liver encymes, cholestasis markers, lipase

Typ I	Typ II
IgG4-Titer increased increased ANA-, RF, Gamma-Globulinemia	IgG4 normal almost no alterations

IgG4 increased:
> 2-times normal = Level 1
1-2-fach = Level 2

NPV 98%
Carcinom: up to 10% increased
(ca. 1-7% also > 2-fach)
The higher the more predictive
> 2-fach: > 90% Spezfisch

HISORT means ? Stands for ?

H: Histology

I: Imaging

S: Serology

O: Other Organ Involvment

RT: Response to Treatment

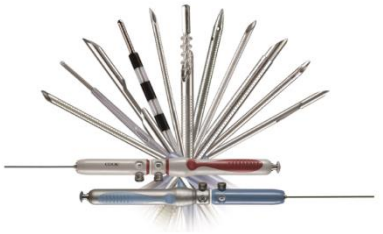
Histology in AIP- differences in types ?

Feature	Typ I	Typ II
Lymphoplasmatic infiltration	Yes	Yes
Periductal inflammation	Yes	Yes
Storiform fibrosis	More prominent	Les
Obliterative Phlebitis	**Characteristic**	R
Granulocyte epithelial lesion (GEL)	Absent	**Characteristic**
IgG4 staining	**> 10/HPF**	Rare

3 of 4 = Level 1

1or 2= Level 2

How to get best result for histo/cytomorphology ?



Level 1 histology diagnosis AIP:

- 19 G- FNA: 43%*
- True-Cut-biopsie in pediatric cases: 82% diagnostic yield[o]
- 22 G- FNB: diagnostic sensitivity 62% +

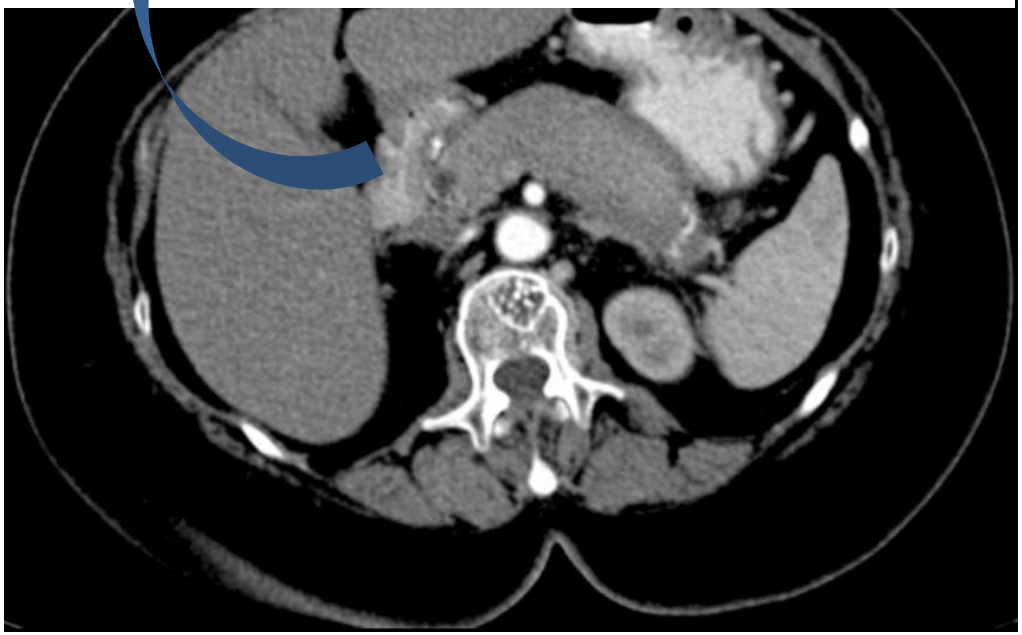
FNA/B for AIP very heterogenous results ….

- Iwashita T et al. CHG 2012 [o:] Fujii GIE 2013;
- + Kanno et al. CJG 2020 [1:] Kurita et al. GIE 2020

Imaging in AIP: characteristic features ?

Sausage-shaped pancreas
delayed contrast-enhancement in CT
Level 1 diagnostic for Typ I AIP

PS: rim-like capsule
In only 30-40%
but very specific

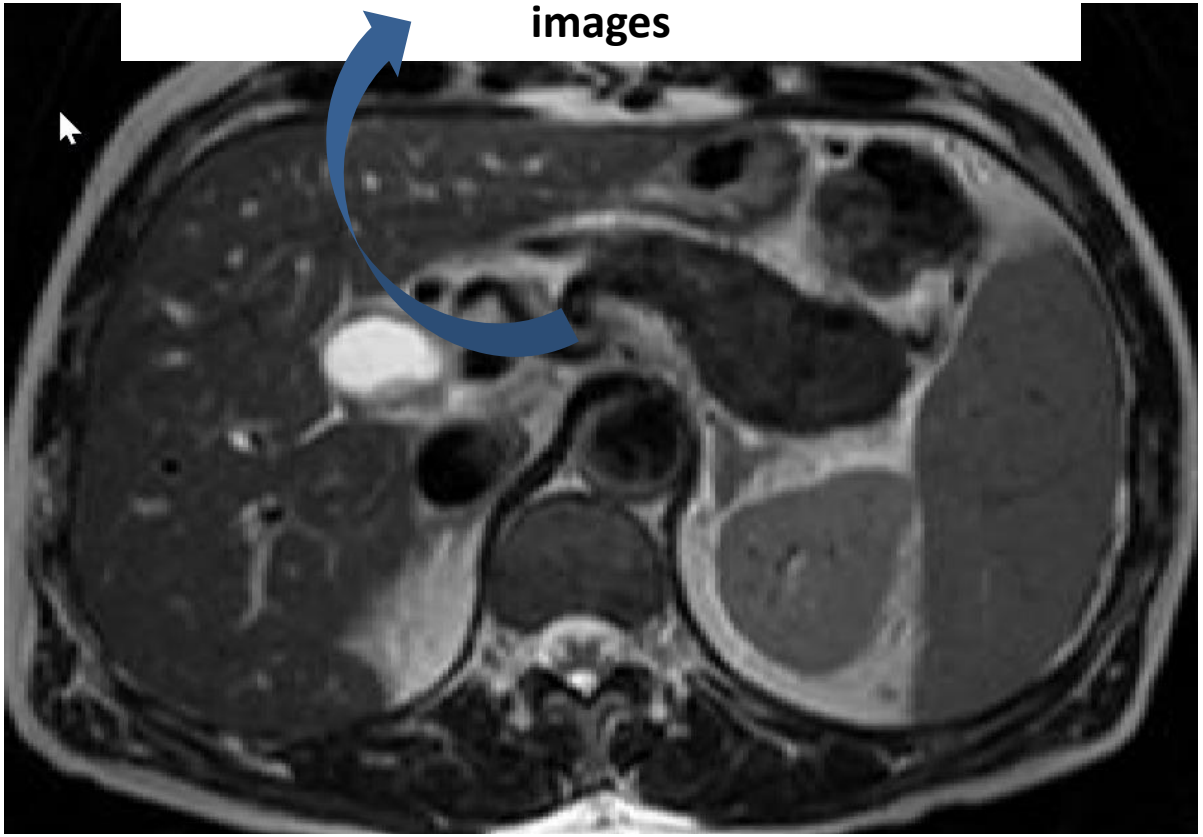


Level 2: Unclear focal/ mild

Level 1: = typical Pathognom.

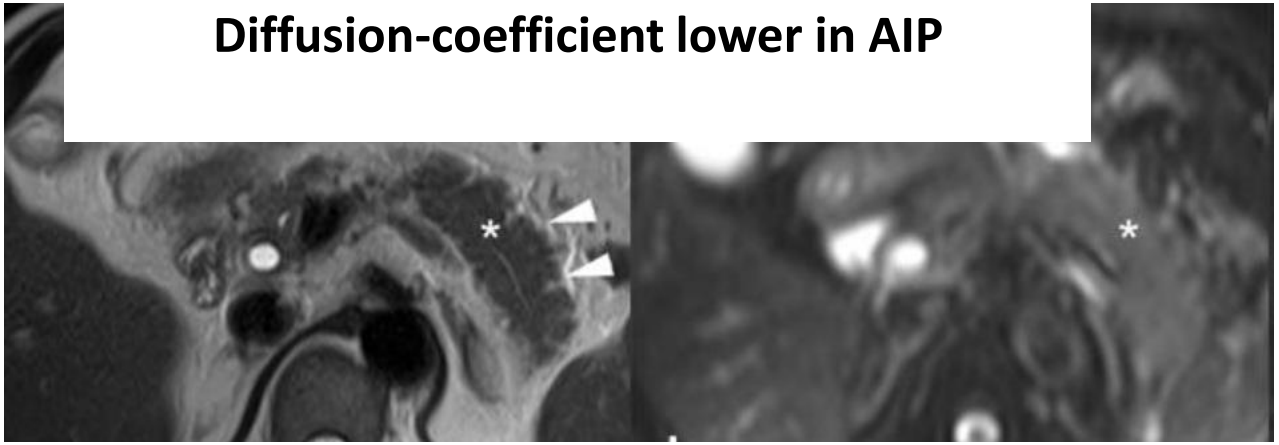
Imaging in AIP: characteristic features ?

NMR:
diffusely hypointense on T1-weighted images and slightly hyperintense on T2-weighted images

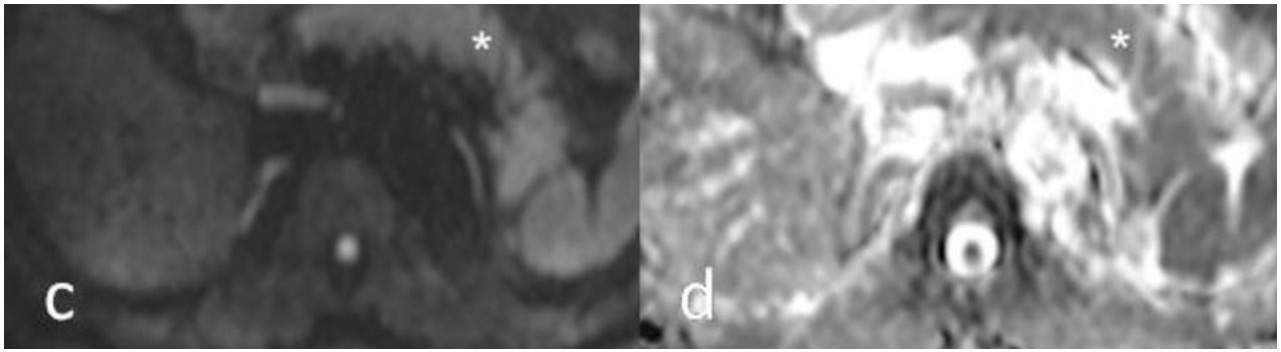


Imaging in AIP: characteristic features ?

Diffusions-MR
Diffusion-coefficient lower in AIP



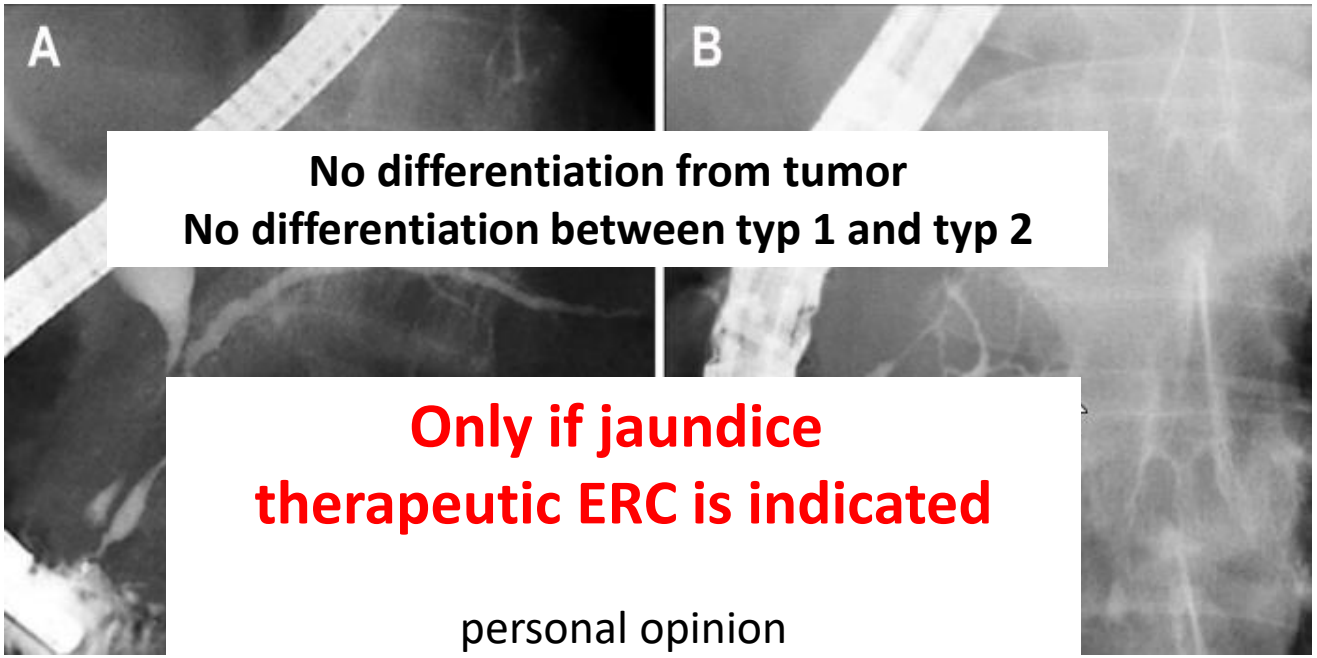
AIP (1.01 +/- 0.11 x 10-3 mm2/s)
pancreatic cancer (1.25 +/- 0.11 x 10-3 mm2/s)
normal pancreas (1.49 +/- 0.16 x 10-3 mm2/s)
(P<0.001)



Kamisawa et al. 2018

ERCP for diagnosing AIP ?

main pancreatic duct
diffus narrowing or long (> 1/3 of PD) or multifocal strictures….



No differentiation from tumor
No differentiation between typ 1 and typ 2

Only if jaundice
therapeutic ERC is indicated

personal opinion

International Consensus Diagnostic Criteria (ICDC: Japan)
ERP-findings included (not usual in western countries)

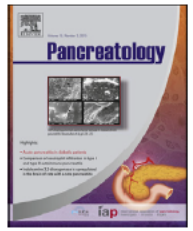
If you do ERCP what to add/perform ?

Pancreatology 15 (2015) 259–264

Contents lists available at ScienceDirect

Pancreatology

journal homepage: www.elsevier.com/locate/pan



Original article

Comparison of endoscopic retrograde cholangiopancreatography with papillary biopsy and endoscopic ultrasound-guided pancreatic biopsy in the diagnosis of autoimmune pancreatitis

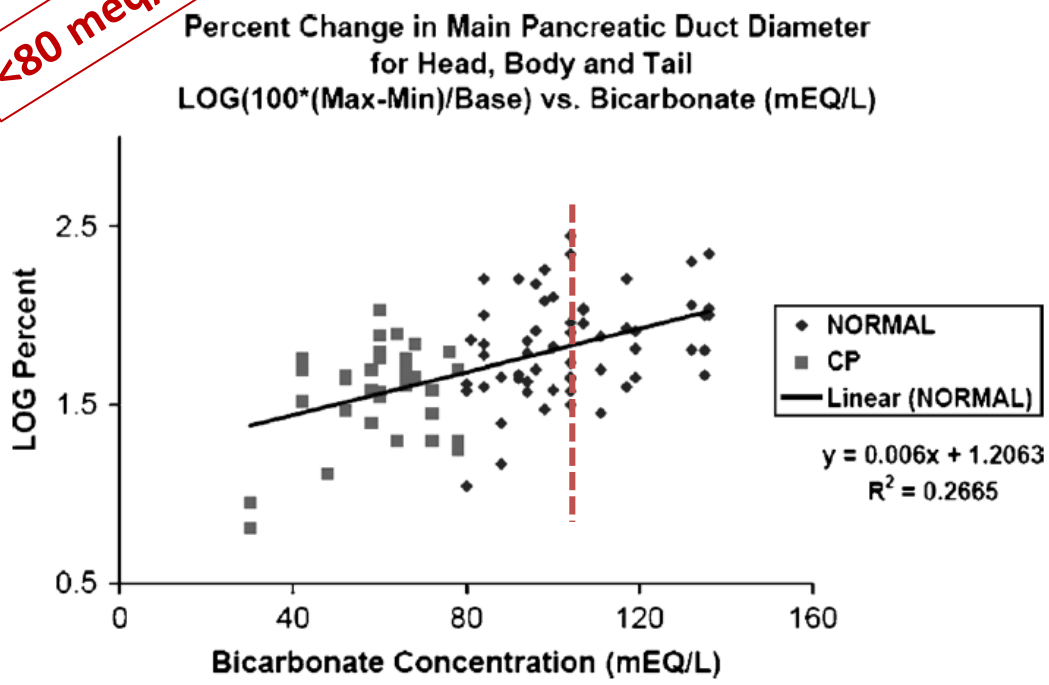
Jae Gu Jung [a], Jong Kyun Lee [b, *, 1], Kwang Hyuck Lee [b], Kyu Taek Lee [b], Young Sik Woo [b], Woo Hyun Paik [c], Do Hyun Park [d], Sang Soo Lee [d], Dong Wan Seo [d], Sung Koo Lee [d], Myung-Hwan Kim [d, **, 1]

Papilla biopsy
increased diagnostic sensitivity
from 65%
to 95%

Most sensitive test for pancreatic exocrine insufficiency ?

Secretin-stimulated HCO3-concenctration in duodenal juice (plus EUS-PD)

<80 meq/L HCO3-



Gardner TB et al. Pancreas 2012

EUS-radial measurement PD
Before and after secretin

P.Duct in tail	change
CP	144 %
normal	241 %
P-value	0.01

Diagnostic exocrine Pancreas-Insufficiency (ePI)

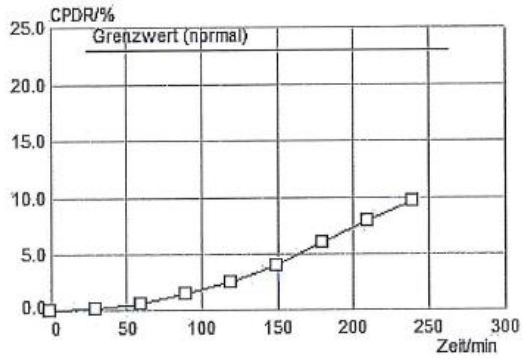
Test	Leichte ePI	Mässige ePI	Höhergradige ePI	Spezifität
	Sensitivität	Sensitivität	Sensitivität	
Elastase-Stuhl	**54%**	75%	**95%**	**85%**
Qual. Stuhlfett	0%	0%	78%	70%
Chymotrypsinakt. Stuhl	<50%	Ca. 60%	80-90%	80-90%
C13 Atemtest (gem. Triglyceride)	**62-100%**	**-**	**90-100%**	**80-90%**

Pankreas-Elastase im Stuhl: < 200 mikrogramm/g Stuhl
bei Diarrhoe falsches Ergebnis, nur treffsicher bei höhergradiger Insuffizienz

How to monitor creon/lipase-substitution-success ?

Mixed Triglyceride ^{13}C Atemtest

Name: Binggeli Jürg
Geb. Datum: 26.04.1958



Befund Mixed Triglyceride ^{13}C Atemtest **Fehlfunktion**

CPDR innerhalb 240 Minuten > 23% normal
andernfalls Fehlfunktion (ohne Creon)

Dieser Test: CPDR = 9.6 %

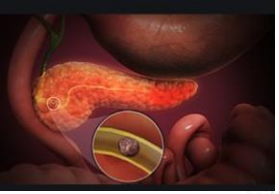
Gut 1998;43 (suppl 3):S13–S19

^{13}C mixed triglyceride breath test

L T Weaver, S Amarri, G R Swart

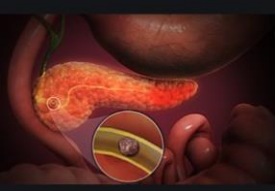
C13 labeled fat that is ingested, digested and Absorbed can be detected in exhaled air = reflects lipolysis within the small intestine

Also sensitive in mild forms of ePI And only test available to monitor under existing drug substitution/therapy

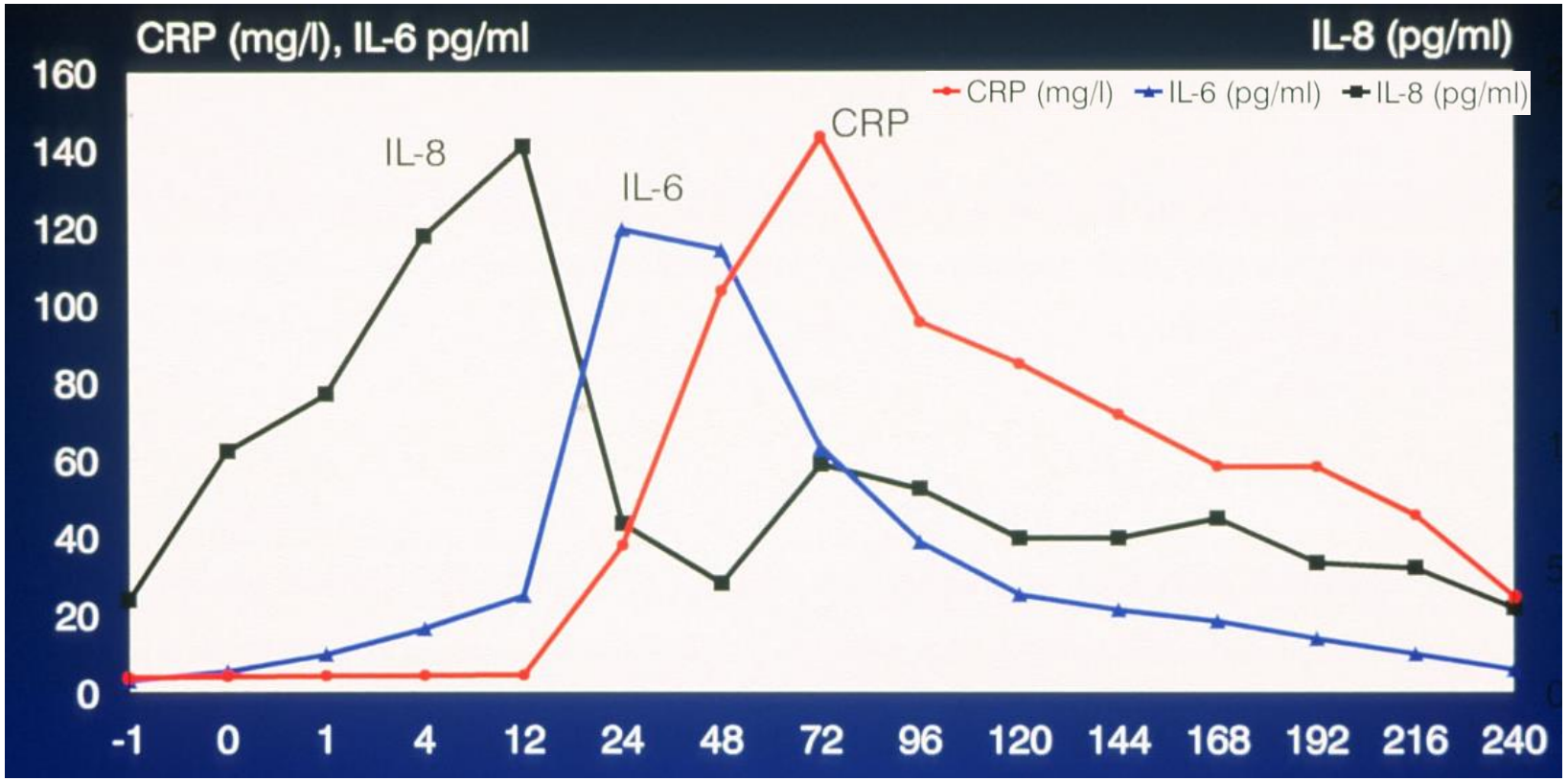


Model Pathophysiology acute pancreatitis

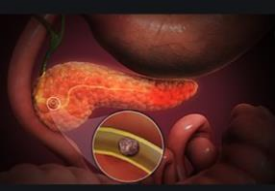
Trigger - Hä: →	Azinuszell-schaden →	Zellaktivierung →	Mediatoren →	Effekte
•Alkohol 40% •Biliär 40% •Autoimmun •Infekt •TG-↑, Ca^{2+}↑ •Neoplasie •Obstruktion •Toxisch •Iatrogen •Vaskulär •Genetisch 10% •Idiopath. 10%	Intraacinäre **Trypsin**-aktivierung ↓ Freisetzung aktiver Enz. -Trypsin -PL2 -Elastase	Neutroph. Lymphozyten Makroph. Endothel	IL-1,6, 8, IL-10,11 TNF-a, IL-1 NO, PAF	<u>Lokal:</u> Ischämie, **Nekrose**, Einblutung, Pseudozyste <u>Systemisch:</u> **SIRS**, ARDS, Schock, MOF



What are the most early pro-inflammatory markers in acute pancreatitis ?



Zeit (h)



How to differentiate mild- moderate-severe AP ?

In Frühphase meist Restitutio

Mild AP

- **No Organfailure**
- No Local- or systemic complications

Mortalität fast keine

Entwickeln eine Spätphase d.h. nicht < 1 Woche Restiutio

Moderate-severe AP

- **Organfailure,** but Resolving < 48 h (= **transient**) u/o
- Lokal- oder systemische Komplikationen

ohne anhaltendes Organversagen

Mortalität erhöht

Severe AP

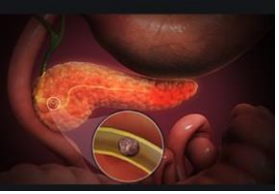
- **persistent organfailure >48 h**

–Single organ failure

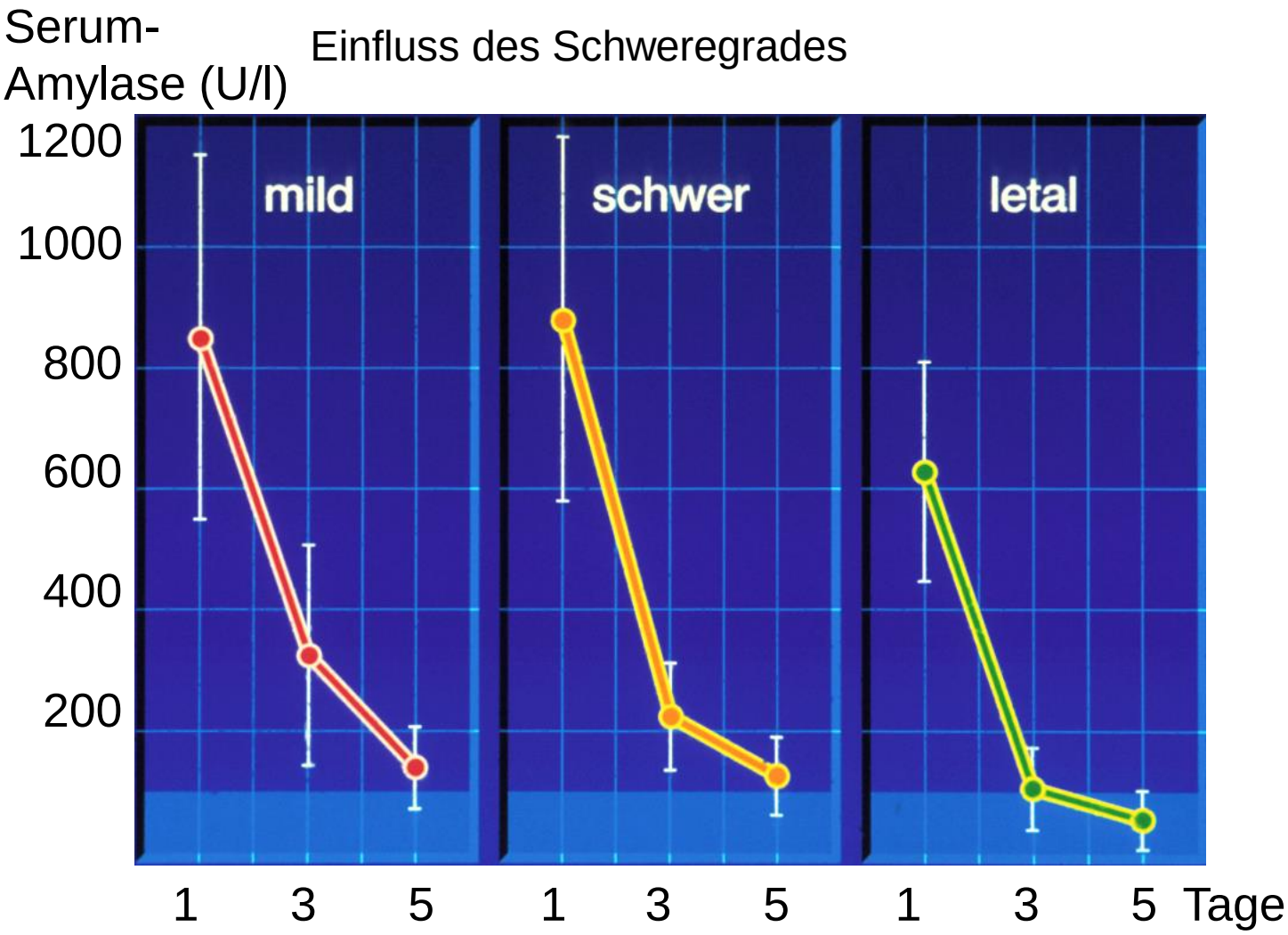
–Multiple organ failure

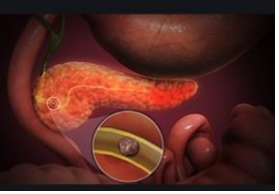
Mortalität hoch

Banks PA et al. Gut 2012 (Revised Atlanta Classification)



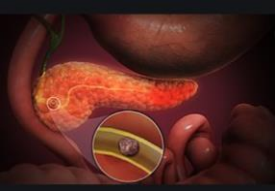
Does serum-lipase help to predict course of AP ?



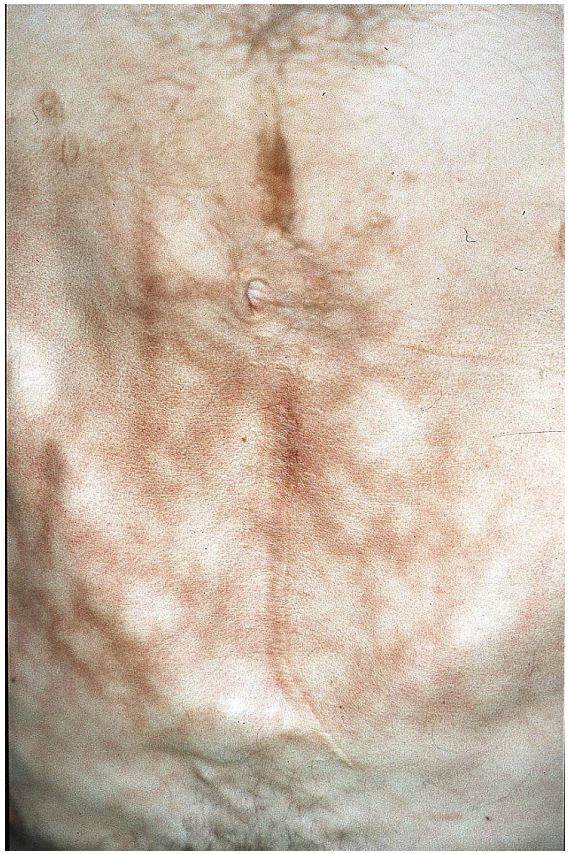


Initial predictive value for fatality in acute pancreatitis

	PPV (%)	NPV (%)	Cut-off
IL-6	**91**	**82**	**> 25 U/ml**
PMN-Elastase	86	79	> 320µg/l
a2-MG	82	67	< 1.5 g/l
CRP	**83**	**86**	**> 150 mg/dl**
a1-AT	59	50	> 4 g/l
Klinischer Score	80	80	> 3



Clinical signs in acute pancreatitis: What is it ?



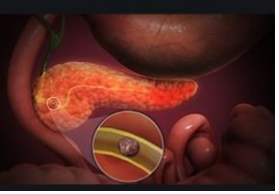
Livedo reticularis ?

Grey-Turner-sign ?

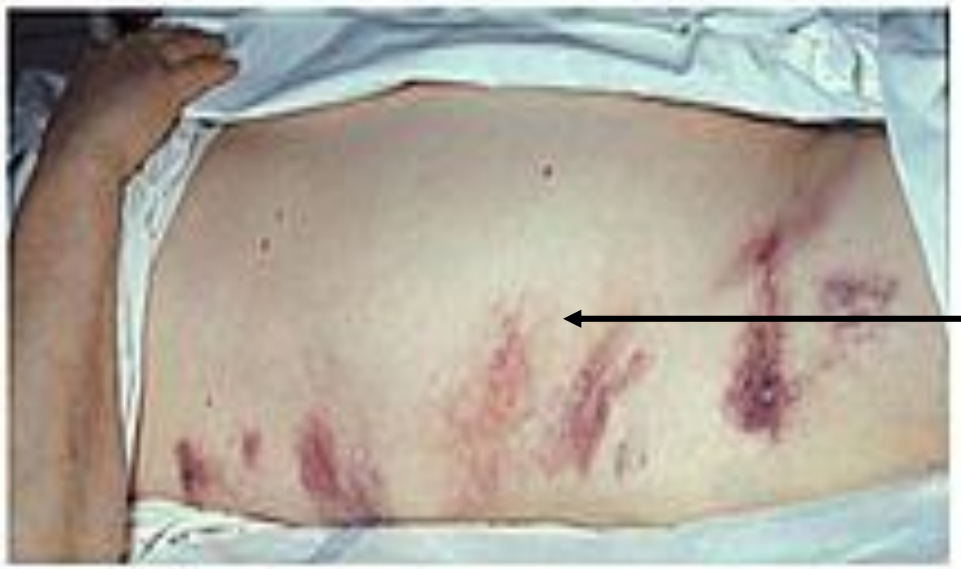
Cullen-sign ?

Post-heating-pat ?

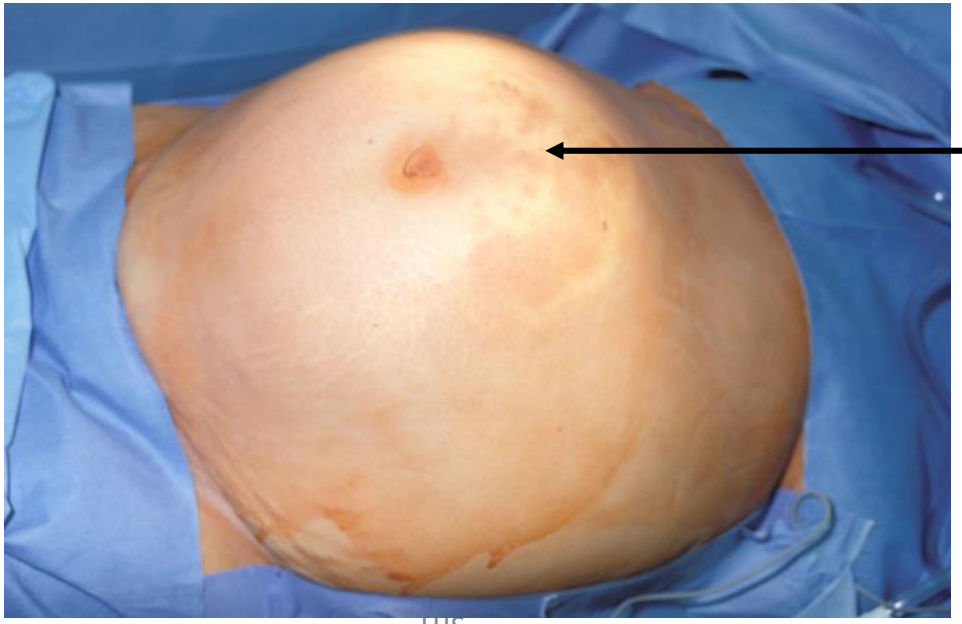
Naevus ?



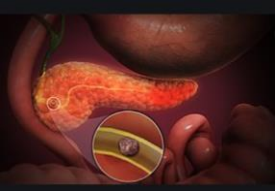
Acute Abdomen at Pancreatitis



Grey-Turner-sign



Cullen-sign



Skin Signs Acute Pancreatitis

Grey-Turner	Flanken
Cullen	Periumbilikal

Inzidenz	3% (n = 770) (9 GT, 9 C, 5 beides)
Mortalität	**37%**

Dickson und Imrie 1984

Therapy/Interventions on Pancreas

Why is it essential if Nardi-Test is positive to differentiate biliary and pancreatic response (lab-work and MRCP)?

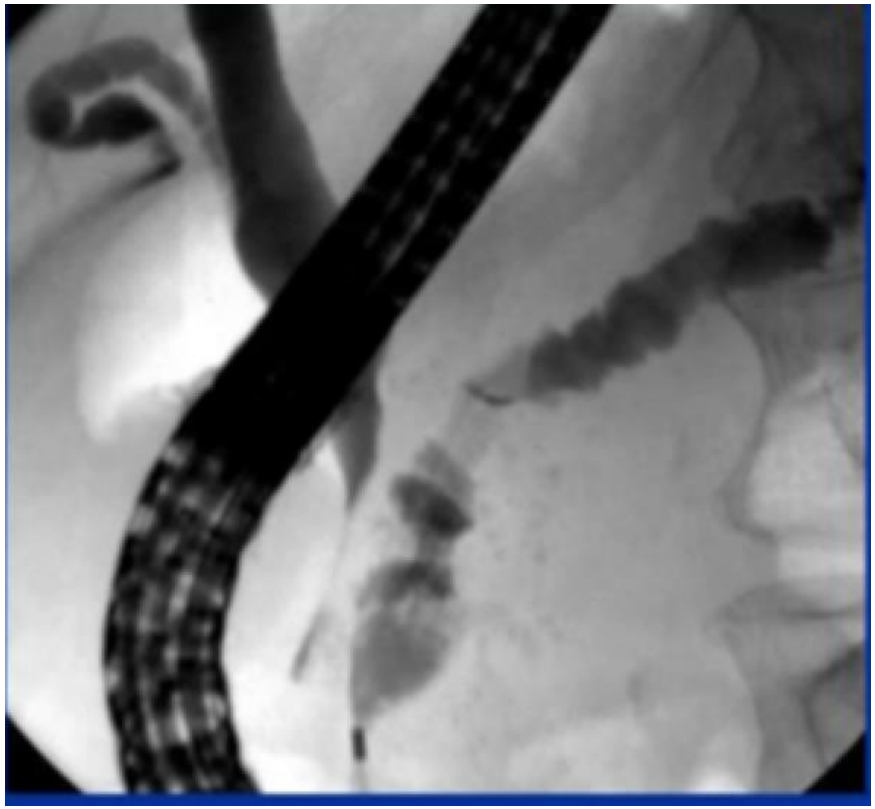
INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

Long term effects after sphincterotomy in patients with suspected functional sphincter Oddi disorder: role of Nardi-Test

Vasileios Oikonomou1, Martin Maurer2, Johannes Heverhagen2, Andrew Macpherson1, Reiner Wiest1
1. Gastroenterology, Clinic for Visceral Surgery and Medicine, University Hospital of Bern,
2. Department of Radiology, University Hospital of Bern.

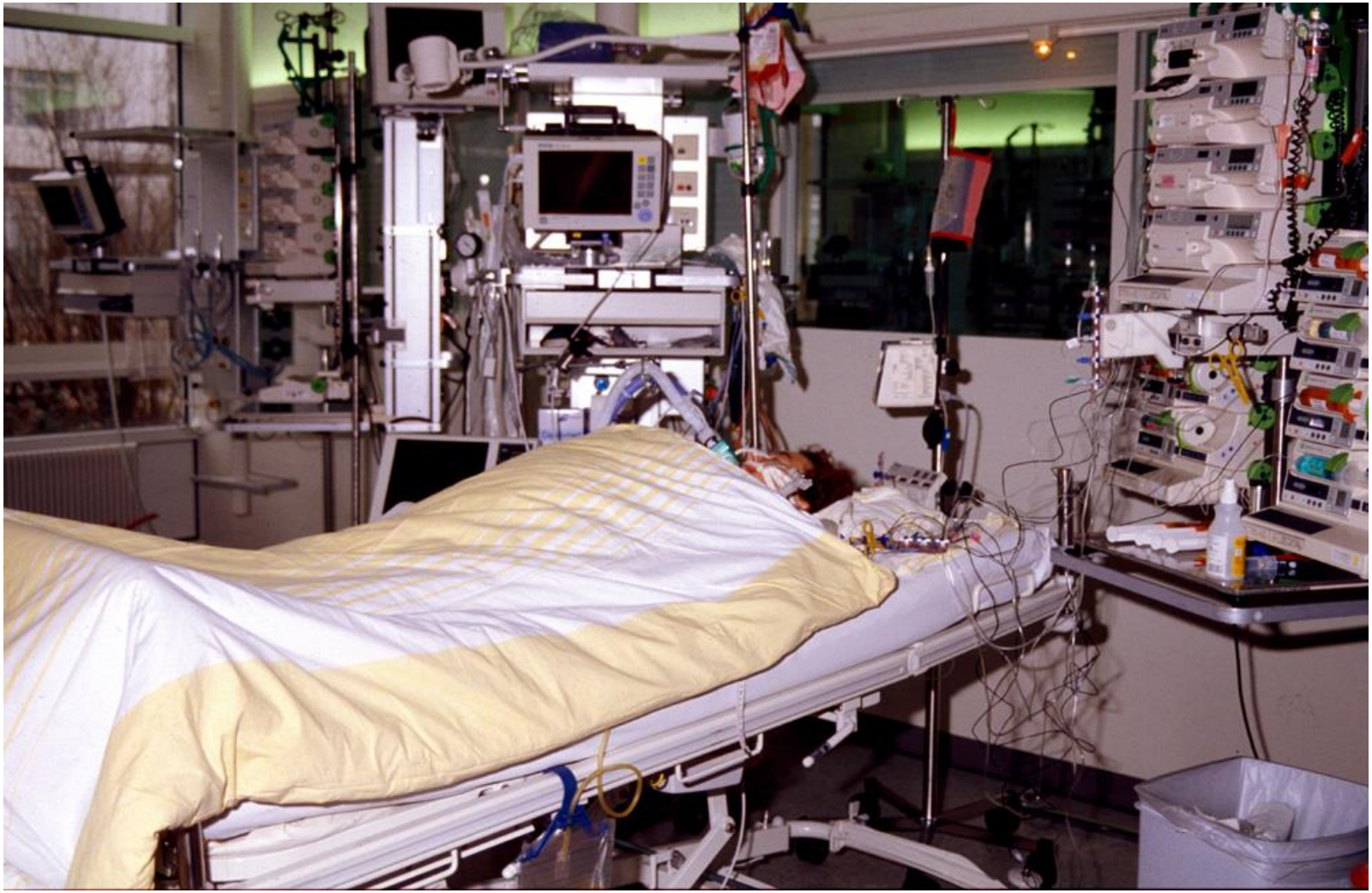
Figure 64.5 The complexity of the sphincter of Oddi. (1) Superior choledochal sphincter; (2) inferior choledochal sphincter; (3) ampullary sphincter; (4) pancreatic sphincter.

48y alcoholic, jaundice, pruritus – best treatment ?



Fully-covered
Metal-Stent
Short 4 cm
Distal CBD

NECROTISING PANCREATITIS – INTENSIVE CARE TREATMENT



Severe acute pancreatitis: Volume Therapy etc.

Monitoring vital signs and urine output

Volumensubstitution (25 …L/h)

e.g. Ringer: in 1…

Early on = essential (> 48 h NO Be…

<3.5 L/24 h = Letality > 60%
Gardener Pancreatology 2009

Evtl. even more as bolus (if de-hydradet, hypotonic, ta…

Controlling success via renal function, urine output o…
creatinin/BUN

Pro 5mg/dL BUN-increase > Doubling mortality
Wu et al. Pancreatology 2009

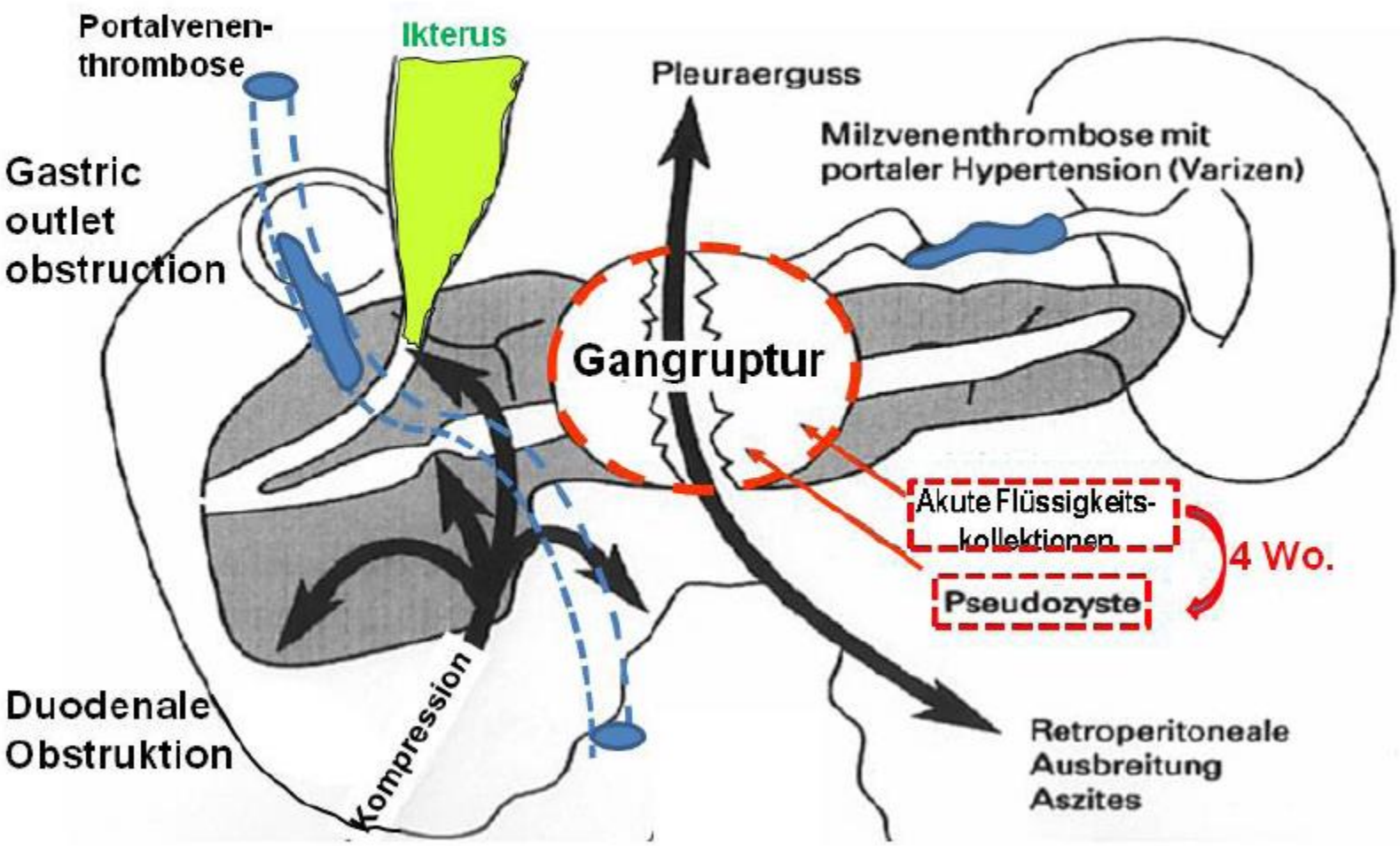
✓ Hypocalcemia seeking and correction (ion. calcium)

✓ Glucose-Monitoring

✓ **Adequate Pain-management (inkl. Opiates, ggf. PDA)**

AGA Guideline 2013

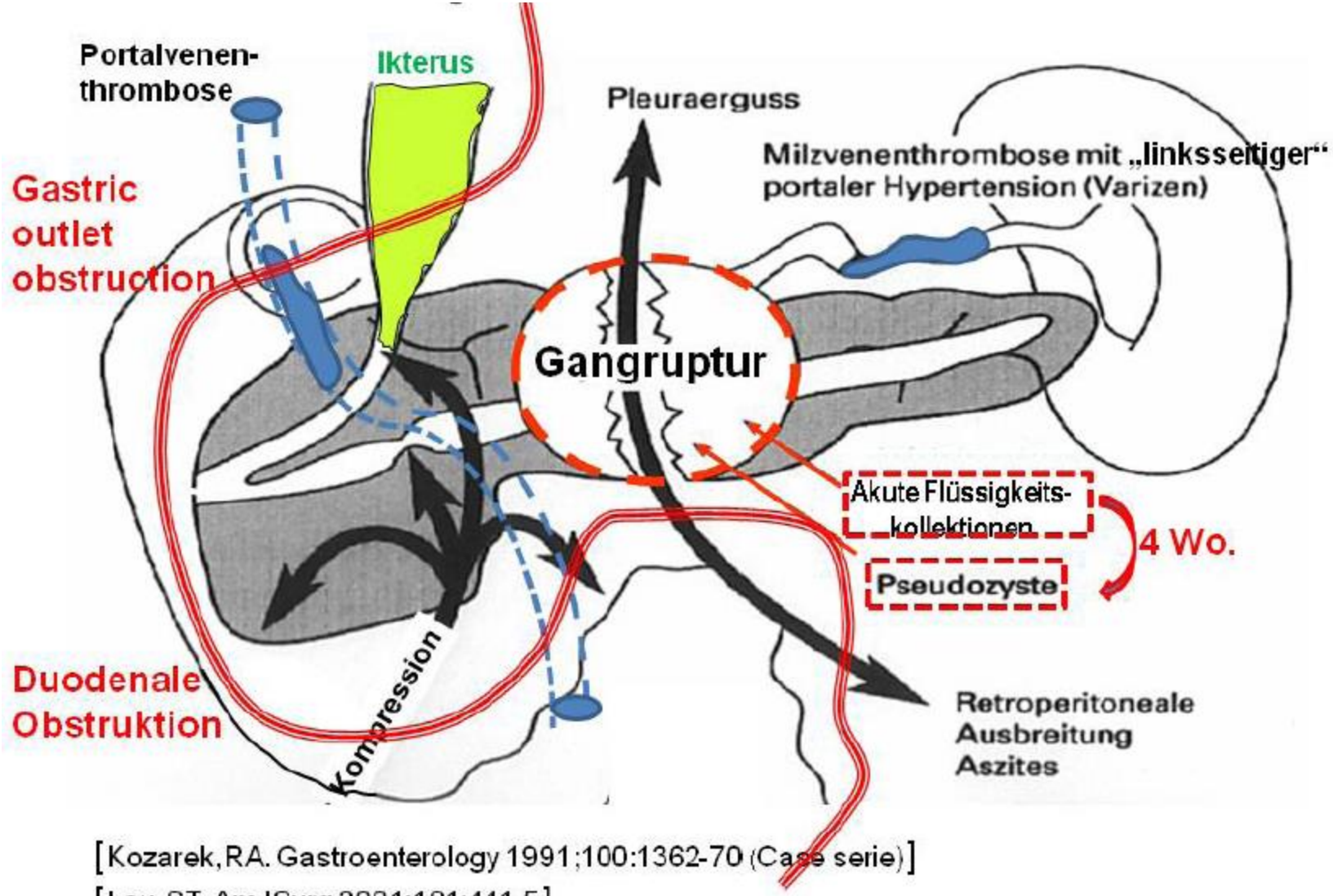
Acute Pancreatitis: Local Complications



[Kozarek, RA. Gastroenterology 1991;100:1362-70 (Case serie)]

[Lau, ST. AmJSurg 2001;181:411-5]

Acute Pancreatitis: Local Complications



[Kozarek, RA. Gastroenterology 1991;100:1362-70 (Case serie)]

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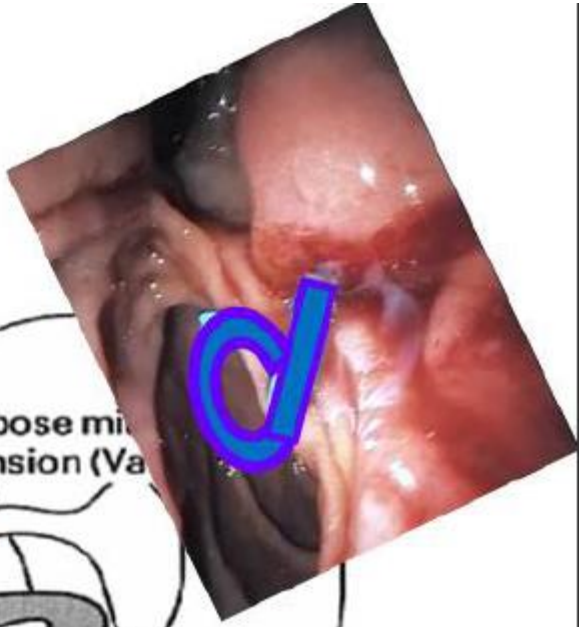
Acute Pancreatitis: Local Complications



Portalvenen-thrombose

Ikterus

Pleuraerguss

Milzvenenthrombose mi
portaler Hypertension (Va

Gastric outlet obstruction

Gangruptur

ERCP +panc. Stent

Akute Flüssigkeits-kollektionen

4 Wo.

Pseudozyste

Duodenale Obstruktion

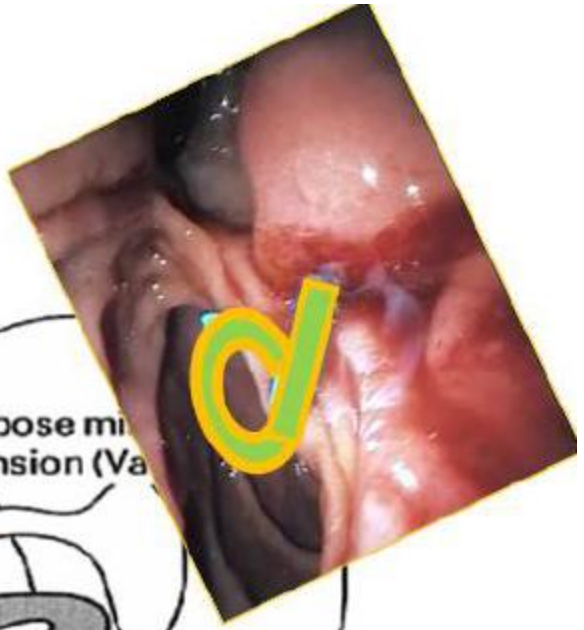
Kompression

Retroperitoneale Ausbreitung Aszites

[Kozarek, RA. Gastroenterology 1991;100:1362-70 (Case serie)]

[Lau, ST. AmJSurg 2001;181:411-5]

Acute Pancreatitis: Local Complications



Portalvenen-thrombose

Ikterus

Pleuraerguss

Milzvenenthrombose mi
portaler Hypertension (Va

Gastric outlet obstruction

ERCP +biliärer Stent

Gangruptur

Akute Flüssigkeits-kollektionen

4 Wo.

Pseudozyste

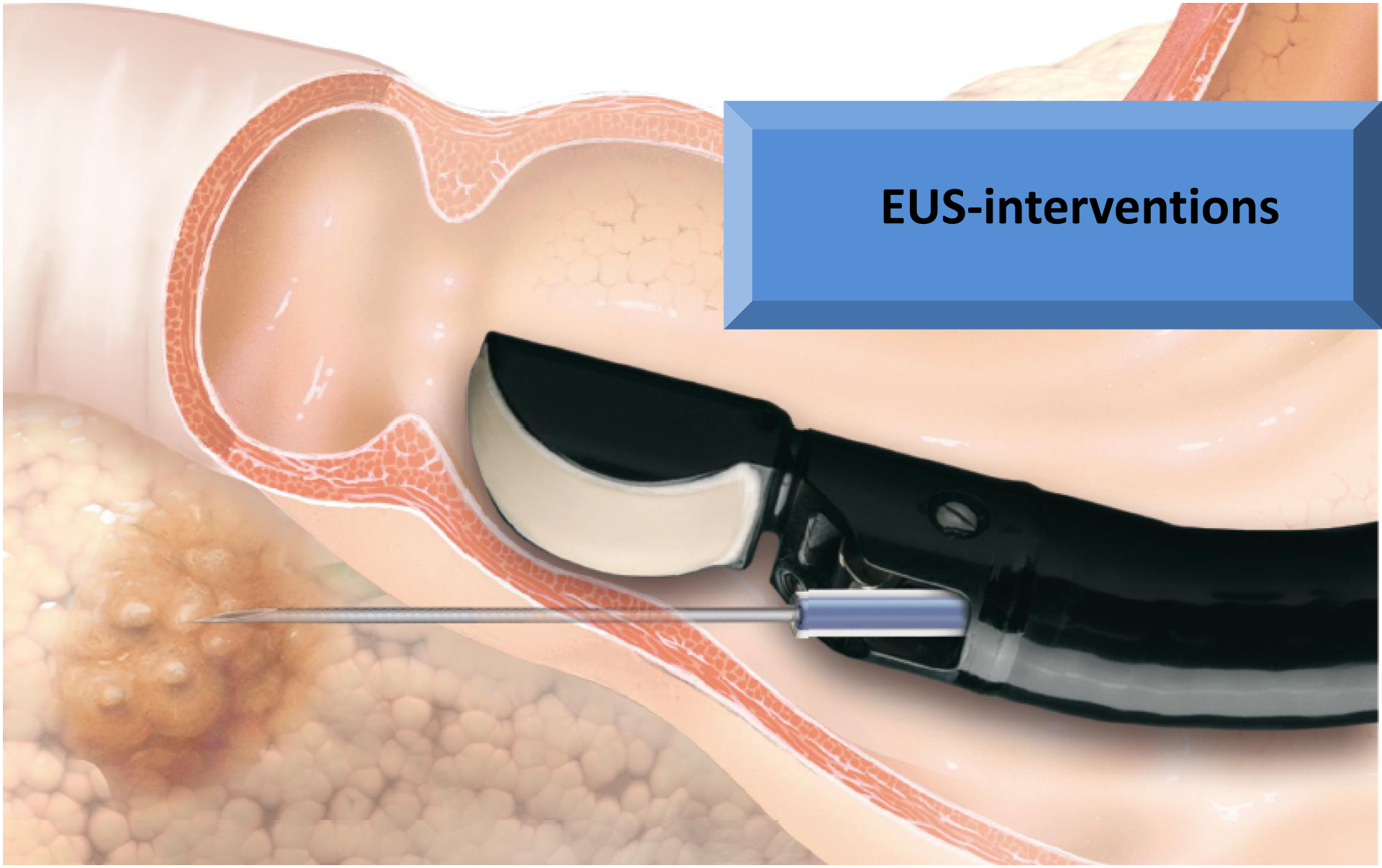
Duodenale Obstruktion

Kompression

Retroperitoneale Ausbreitung Aszites

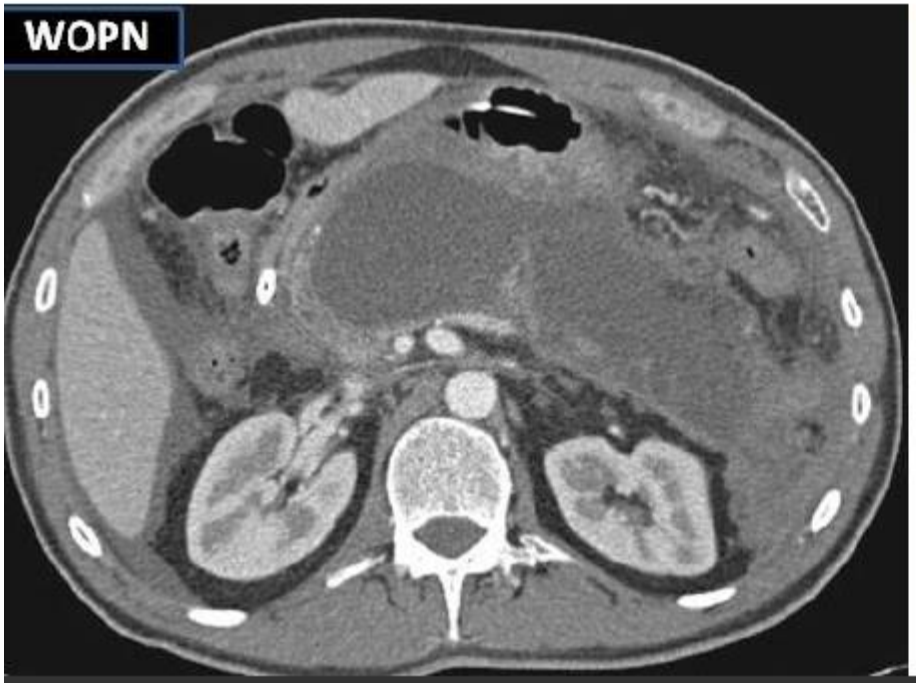
[Kozarek, RA. Gastroenterology 1991;100:1362-70 (Case serie)]

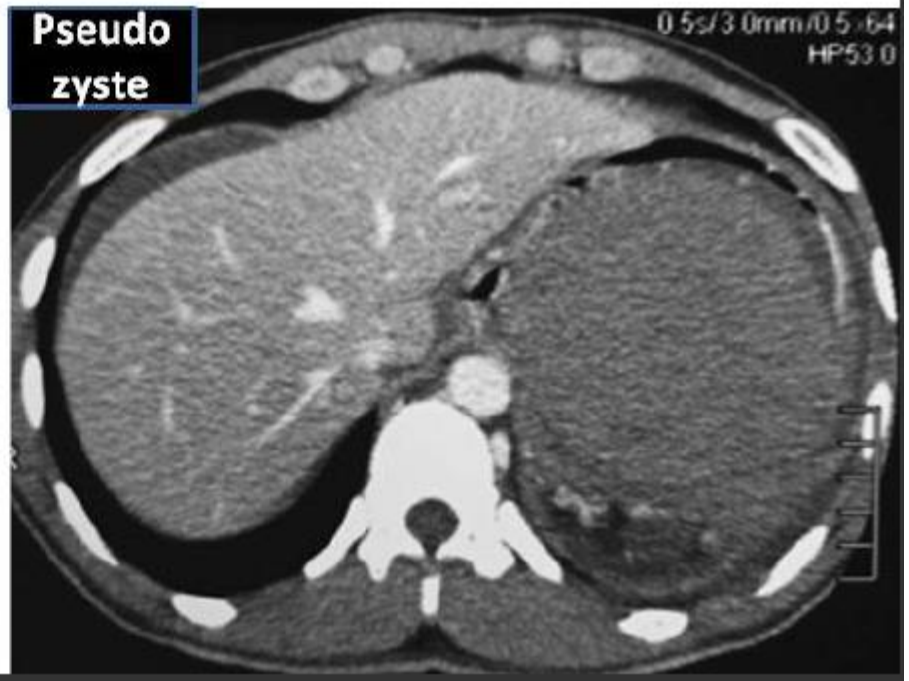
[Lau, ST. AmJSurg 2001;181:411-5]


EUS-interventions

Infection and Impact on Prognosis of Pseudocyst or WOPN

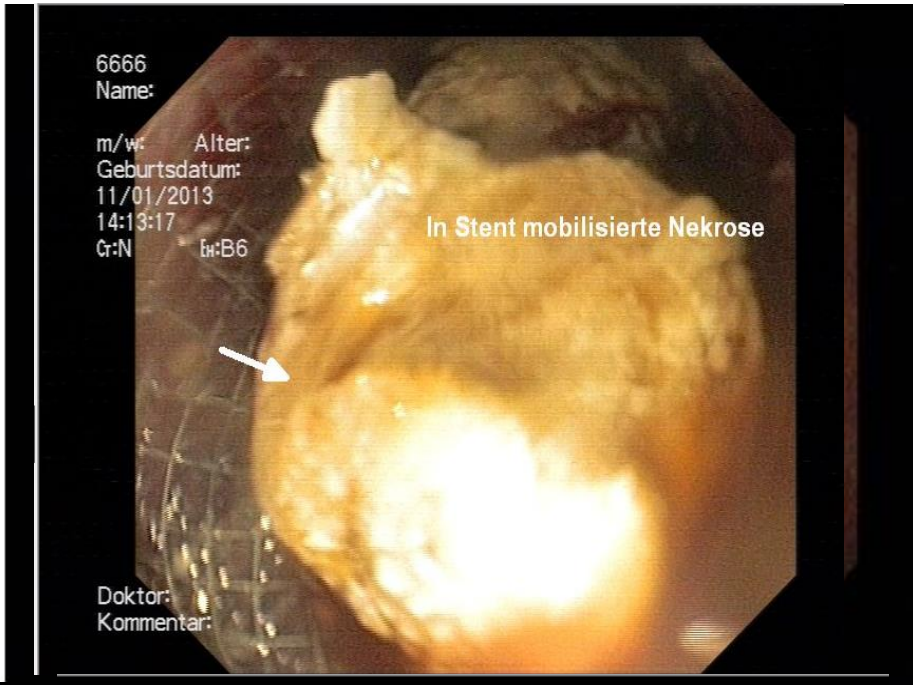
WOPN (walled-off panc. necrosis)	Mortalität
Sterile Nekrose	ca. 10%
Infizierte Nekrose	ca. 30%

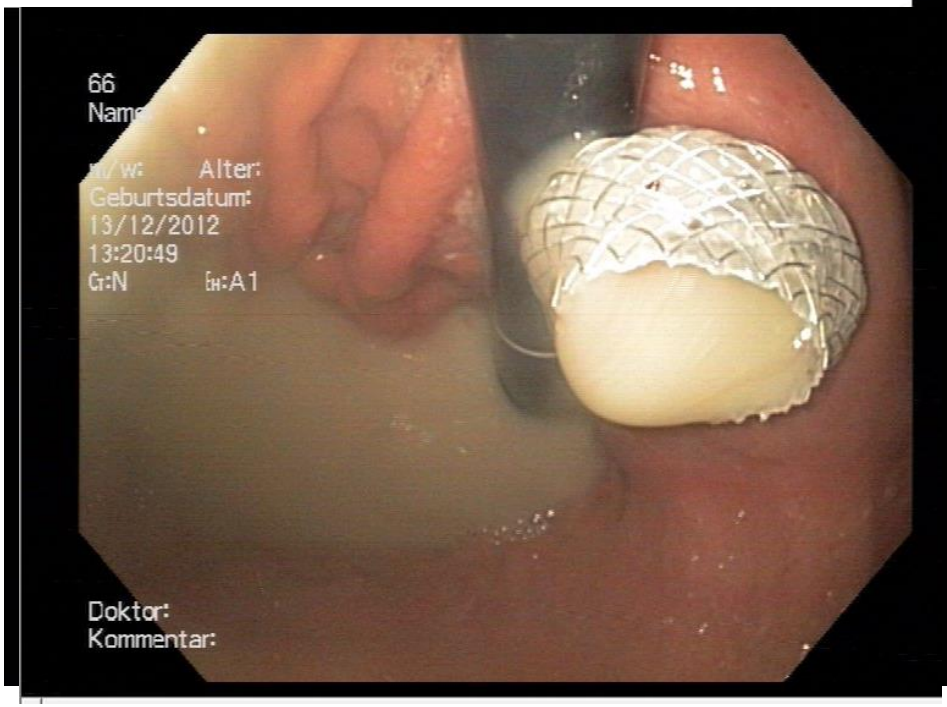


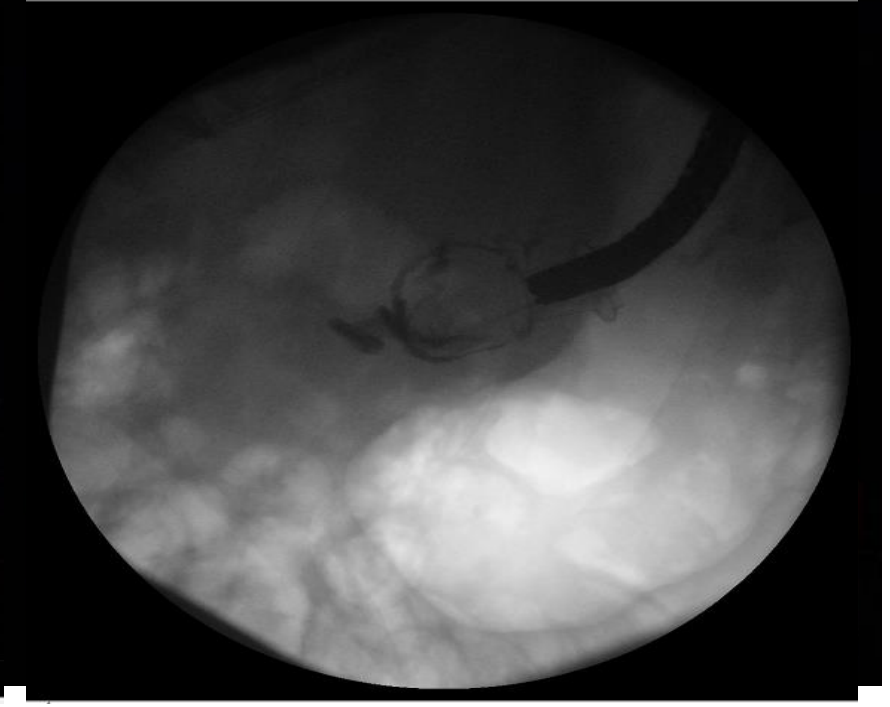


Pseudocyst/WOPN: EUS method of choice

- Endosonographie
  - aetiologische Diagnose
  - morphologische Diagnose
  - Therapie/-planung

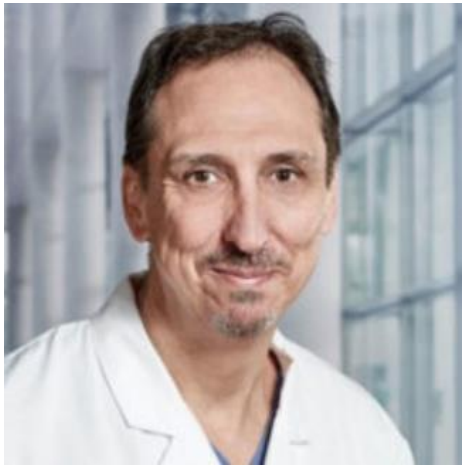




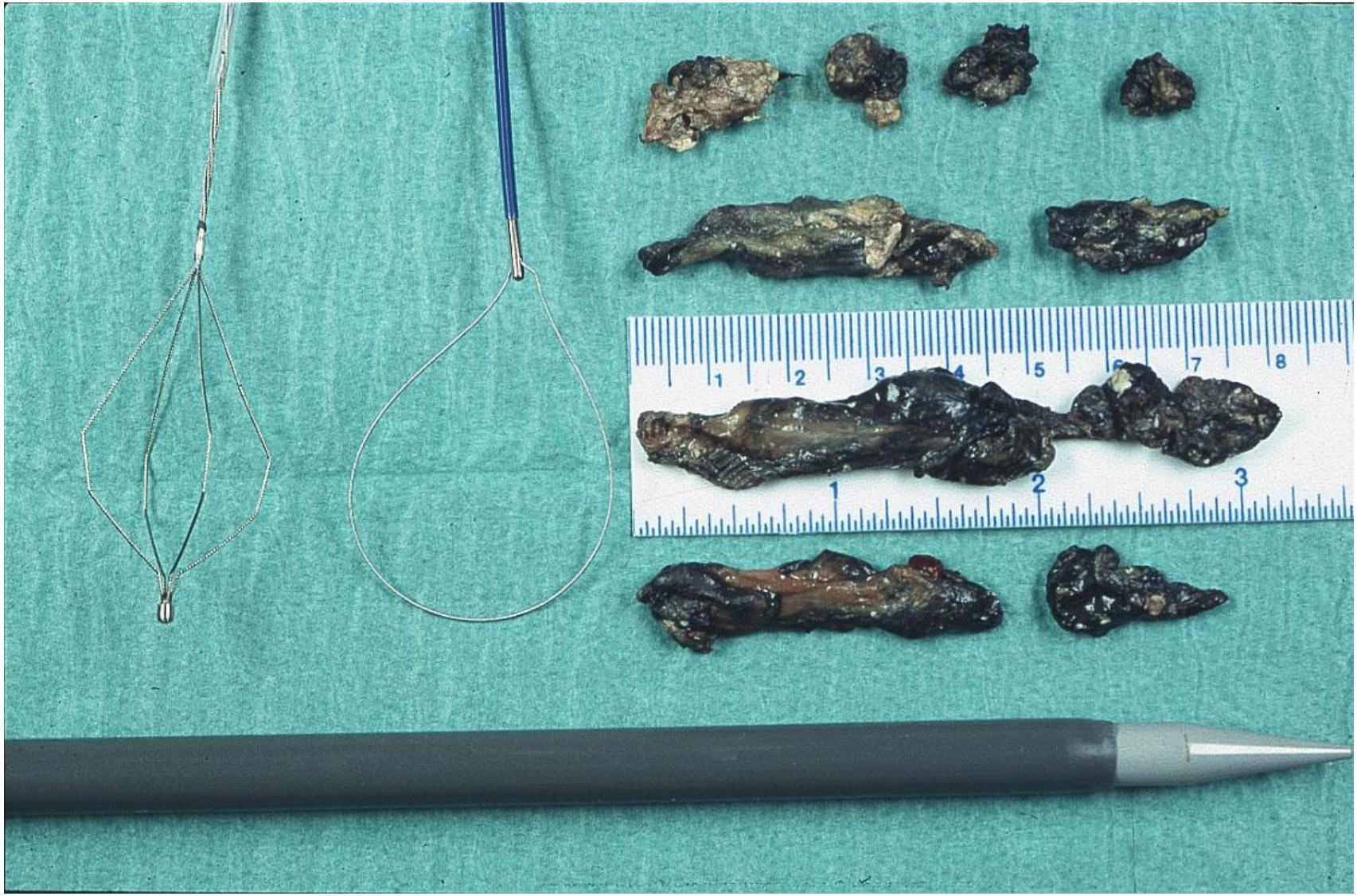


best device to remove necrosis endoscopically ….?

Excavator by Ovesco: Innovation Award to

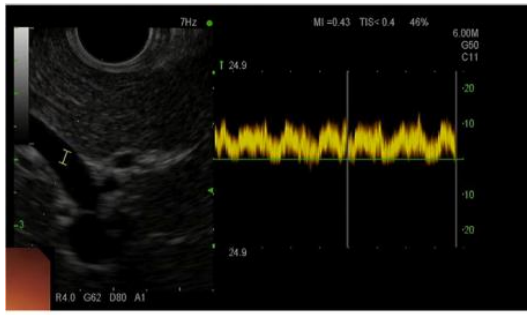


Removed Sequester, Material….



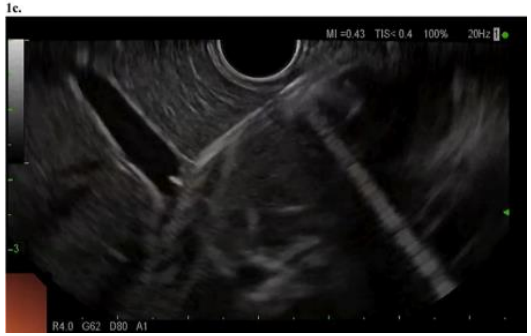
Outlook- Future

EUS-access portal vein: 19 G FNA



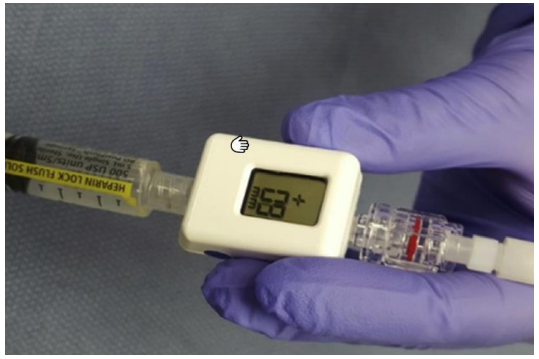
Circulating tumor cells in pancreatic cancer
May predict survival

Waxman I et al. Gastro , Pancreatology 2020



Metabolic profiling enabling investigations
On pathophysiology of obesity, diabetes….

Ryou et al. Am J Physiology 2020

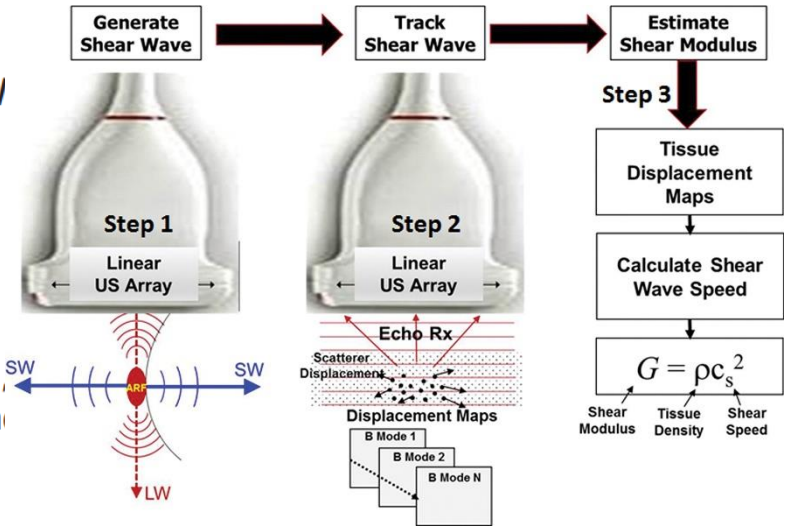


Portal pressure measurement and HVPG-
Analysis ……

Samarasena et al. GIE 2018

Utilisation of artificial intelligence for the development of an EUS-convolutional neural netw model trained to enhance the diagnosis of autoimmune pancreatitis

Neil B Marya ,[1] Patrick D Powers,[2] Suresh T Chari,[3] Ferga C Gleeson,[1] Cadman L Leggett,[1] Barham K Abu Dayyeh ,[1] Vinay Chandrasekhara,[1] Prasad G Iyer ,[1] Shounak Majumder ,[1] Randall K Pearson,[1] Bret T Petersen,[1] Elizabeth Rajan,[1] Tarek Sawas ,[1] Andrew C Storm,[1] Santhi S Vege,[1] Shigao Ch Zaiyang Long,[4] David M Hough,[4] Kristin Mara,[5] Michael J Levy[1]



Article

MiR-10a in Pancreatic Juice as a Biomarker for Invasive Intraductal Papillary Mucinous Neoplasm by miRNA Sequencing

Natsuhiko Kuratomi [1], Shinichi Takano [1,*], Mitsuharu Fukasawa [1], Shinya Maekawa [1], Makoto Kadokura [1], Hiroko Shindo [1], Ei Takahashi [1], Sumio Hirose [1], Yoshimitsu Fukasawa [1], Satoshi Kawakami [1], Hiroshi Hayakawa [1], Hitomi Takada [1], Natsuko Nakakuki [1], Ryoh Kato [1], Tatsuya Yamaguchi [1], Yasuhiro Nakayama [1], Hiromichi Kawaida [2], Hiroshi Kono [2], Taisuke Inoue [1], Tetsuo Kondo [3], Daisuke Ichikawa [2]

From EUS-Pancreatico-Gastrostomy ?.....think about

Shear Wave Elastography
First time available on Linear EUS

DIA-PANC-Study
Diagnostic accuracy
In staging pancreatic cancer

What should you eat to treat your pancreas well ?

ORIGINAL ARTICLE

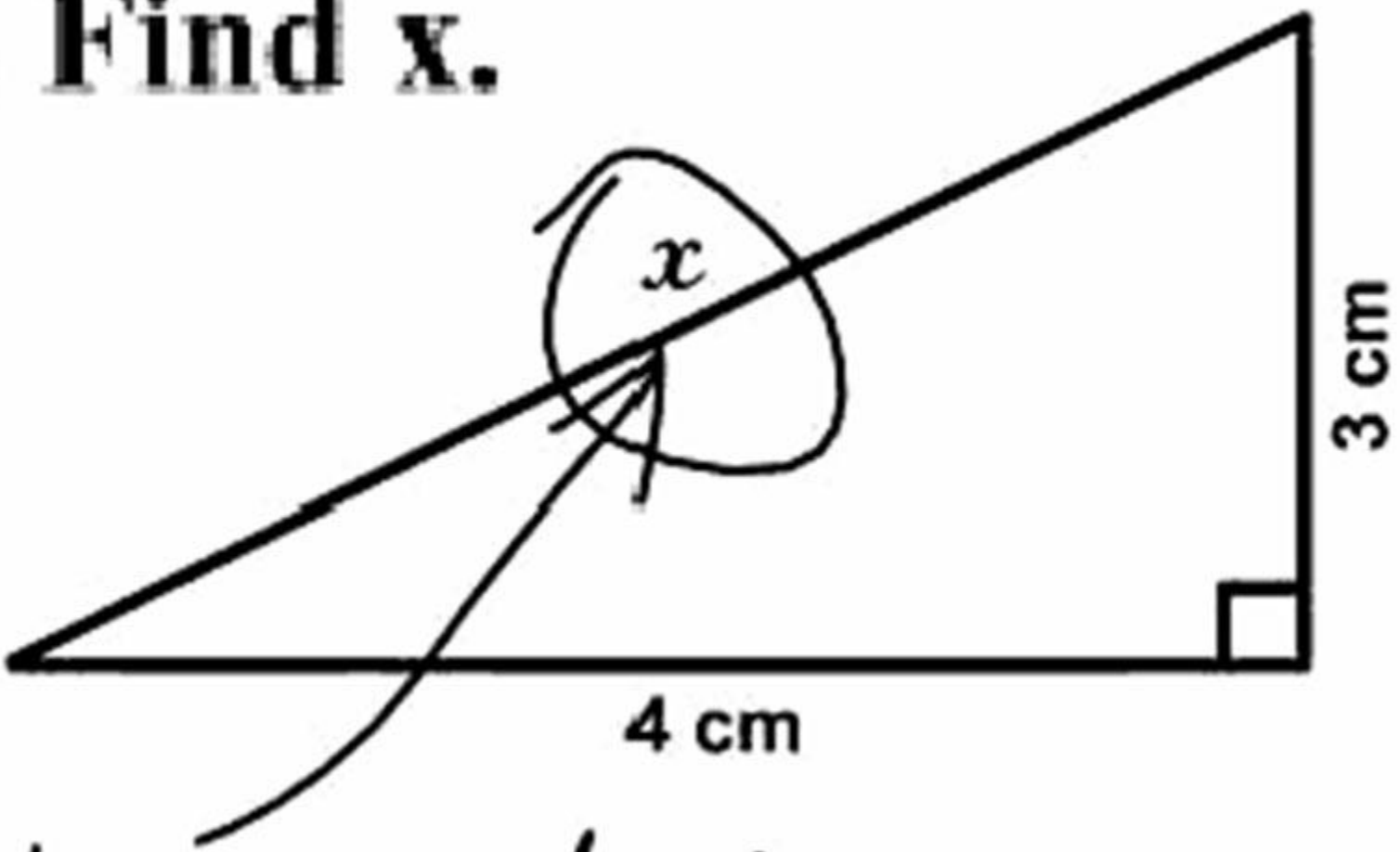
Vegetables, fruit and risk of non-gallstone-related acute pancreatitis: a population-based prospective cohort study

Viktor Oskarsson,[1] Omid Sadr-Azodi,[1,2] Nicola Orsini,[1] Åke Andrén-Sandberg,[2] Alicja Wolk[1]

Gut 2017

Keep it simple!

3. Find x.



Here it is