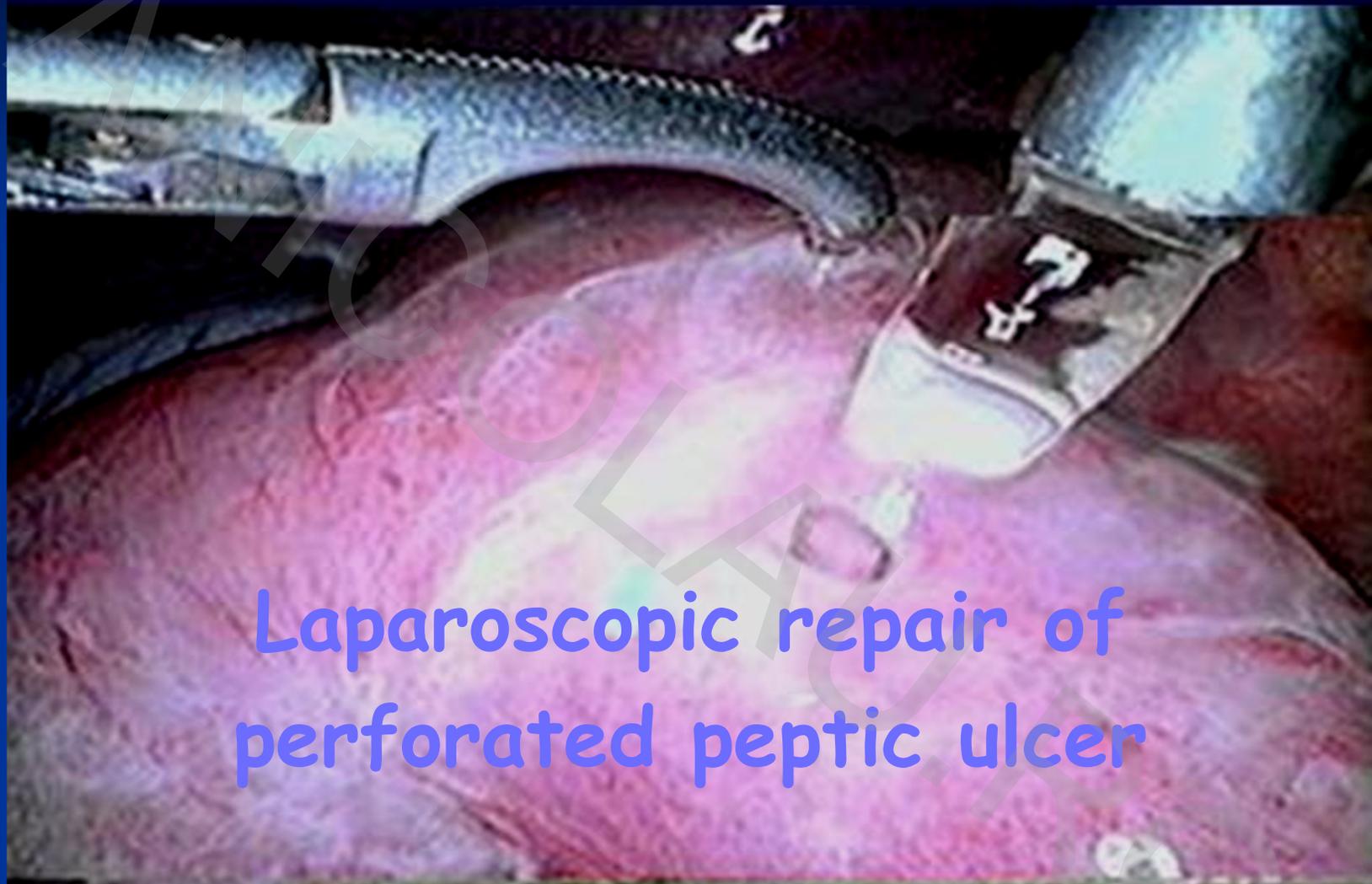


Clinical Emergency Hospital
Floreasca, Bucharest

Department of Surgery



Laparoscopic repair of
perforated peptic ulcer



A.E. Nicolau

Incidence of PPU

- Perforated peptic ulcer (PPU) is the most common indication for emergency operations in complicated ulcer disease.
- PPU occurs in about 2-10% of peptic ulcers with an overall mortality of 3-14%
- Recently, due to proton pump inhibitors (PPI) and *H. pylori* eradication therapy, the number of operations for PPU is decreasing.



Incidence of PPU

Year	1993	2006
PPU	3916 (9,6%)	2914 (9,2%)
Mortality	15,1%	10,6%

[Wang YR, An Surg, 2010]



Incidence of operations for PPU in Clinical Emergency Hospital



Antiulcer therapy (PPI+H.pylory eradication) = definitive operation

- 20 years ago, suture of PDU \Rightarrow "law of thirds"
 - 1/3 cured permanently
 - 1/3 require long-term medical anti-ulcer therapy
 - 1/3 require definitive ulcer surgery
- Closure + antiulcer therapy  standard therapy of PPU
- Eradication of H.pylori reduces the relapse rate after simple closure of PPU from 29,2-42% to 4,8-6,1%

[Ng EKW et al, Ann Surg, 2002; El-Nakeeb et al, Int J Surg, 2008]
- Recurrence after TV + pyloroplasty = closure + antiulcer therapy

"Does the patient benefit when I choose the laparoscopic approach?"

[Pappas N, Lagoo SA, Ann Surg,2002]

!!! Peritonitis influences the benefits of laparoscopic approach and the recovery

- If symptoms and diagnostic findings are suggestive of PPU, diagnostic laparoscopy and laparoscopic repair are recommended (GoR A)
- Laparoscopic expertise team

[The EAES clinical practice guidelines on laparoscopy for abdominal emergencies, 2006]

➤ Unselected cases:

- advantages: less analgesic use

[Druart ML et al, Surg Endosc, 1997; Lau WY, Ann Surg, 1996]



Laparoscopic versus open repair: review of literature (n=1872)

+ Laparoscopy:

- ↓ Postoperative pain
 - ↓ Hospital stay
 - ↓ Wound infections
 - ↓ Return to normal activity
 - ↓ Morbidity
 - ↓ Mortality
- Better postoperative outcome

- Laparoscopy:

- ↑ Operating time
- ↑ Suture leakage

[Bertleff MJOE,Lange JF,Surg Endosc,2009



3 RCT (n=325)

Author	LG (N=)	OG (N=)
W.Y.Lau (1996)	52	51
W.T. Siu (2002)	58	63
M. Bertleff (2009)	52	49

[Bertleff MJOE,Lange JF,Surg Endosc,2009]



Average results of 3 RCT (n=325)

	LG	OG
Op. time (min)	70,3	52,1
VAS (day 1)	3,8	5,5
Hospital stay	6	6,5
Normal diet (days)	4	4
Normal daily activities (days)	10,4	26,1
Wound infections (%)	0	6,1
Leakage (%)	3	1,1
Morbidity (%)	22	36
Mortality (%)	2,5	5,8



p<0,05

[Bertleff MJOE,Lange JF,Surg Endosc,2009]

Perforated gastric ulcer

- Gastric localization of PPU: 4-13%
- Prepyloric perforated ulcer = perforated duodenal ulcer (same pathophysiology)
- Gastric ulcer located along the lesser curvature of the stomach: ulcer excision + biopsy (malignant ulcer?) + defect suture (not recommended for laparoscopy)

[Martin RF, Surg Clin N Am, 2005]



Risk factors associated with unsuccessful laparoscopic repair

- Main risk factors:

- Boey risk factors:

- Shock on admission (SBP < 90mm)
 - Delayed presentation (> 24 h)
 - ASA III/IV

- Boey score has four distinct degrees: 0,1,2,3
 - Conversion rate, morbidity and mortality increase progressively with an increasing Boey score



- Older age \geq 70 years
 - APACHE II $>$ 5
 - Perforation $>$ 1 cm
 - Laparoscopic expertise
- Secondary risk factors: anemia, malnutrition, abdominal distension, renal failure, corticotherapy, etc.
- Open repair might be a safer option in high-risk patients although there is no hard evidence

[Lunevicius R, Morkevicius M, World J Surg, 2005]



Main conversion reasons (21 studies, n=2346)

Perforation size (>1cm)	9,4%
Inadequate ulcer localisation	6,6%
Friable edges	6,4%
Cardiovascular instability	4,4%
Severe peritonitis	4,2%
Posterior localisations	3,9%
Technical difficulties	2,2%

Conversion rate 12,4% (0-28,5%)



Main postop.complications (10 studies, n=1802)

Intraabdominal collections	5,7%
MODS	4,7%
Sepsis	4,6%
Reoperation	4,5%
Suture leakage	3,8%
Pneumonia	3,4%
Fistula	1,7%
Wound dehiscence	0,8%

Morbidity: 14,3% (4-28%)

[Bertleff MJOE,Lange JF,Surg Endosc,2009]



Boey's scoring system for predicting postoperative mortality

Author	Year	Mortality (average)	Mortality and Boey risk factors			
			0	1	2	3
Boey J	1987	6,2%	0%	10%	45,5%	100%
Lee FYJ	2001	7,8%	1,5%	14,4%	32,1%	100%
Arici C	2007	13,6%	0%	12%	32%	63%
Lohsiriwat V	2008	9%	1%	8%	33%	38%

Mortality (17 studies, n=1802): 5,8% (0-20%)



[Bertleff MJOE, Lange JF, Surg Endosc, 2009]

Indications for laparotomy

Septic shock \Rightarrow absolute contraindication for laparoscopy

- Hemodynamic instability
- Patient with multiple abdominal operations
- Simultaneous bleeding/stenosis
- Major cardiac and/or pulmonary comorbidities (contraindications for pneumoperitoneum)
- Surgeon's inexperience and inadequate equipment for laparoscopic repair

[Lunevicius R, Morkevicius M, World J Surg, 2005]



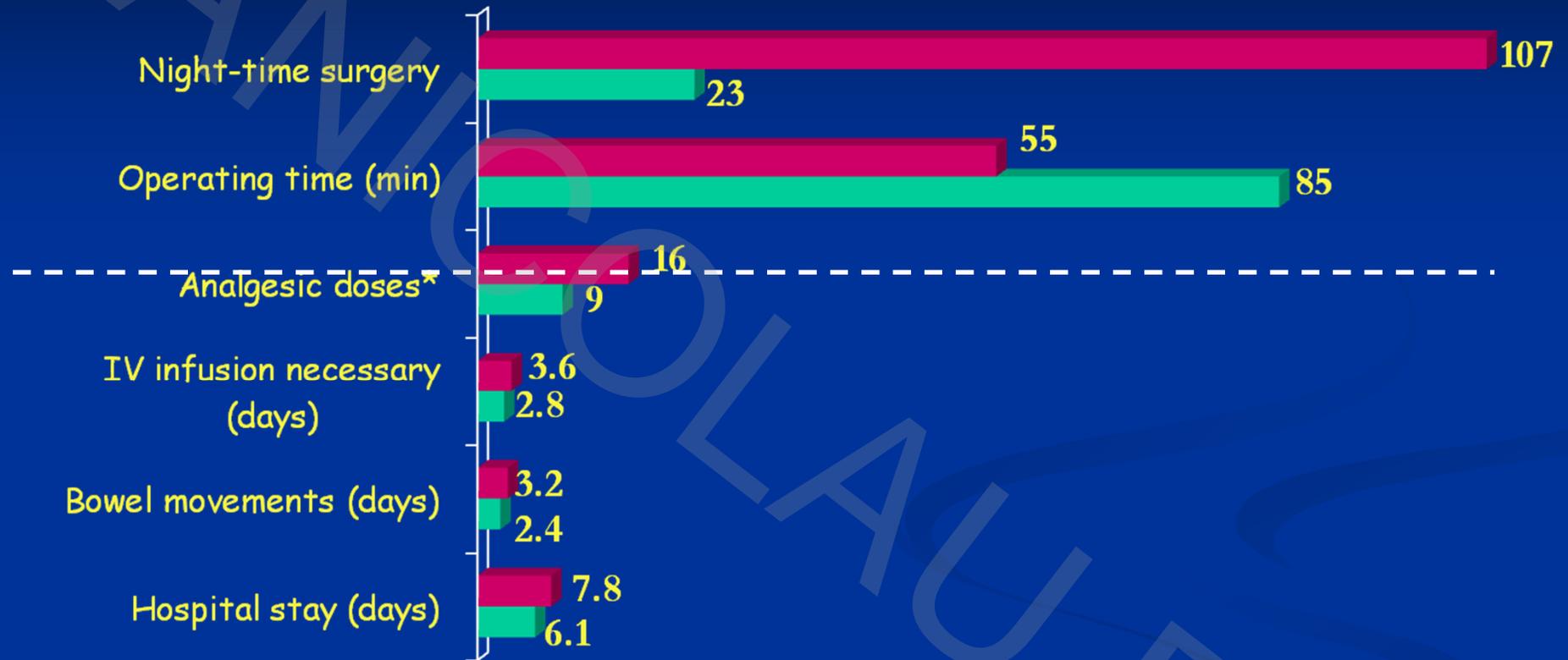
Laparoscopic vs open suture of PDU with low risk factors

- Selection criteria
 - Age < 50 years
 - Onset-operation interval < 12 hours
 - No comorbidities (ASA I/II)
 - Without previous abdominal surgery

[Nicolau, AE et al, Chirurgia,2008]



Results II



*as requested, maximum 5 doses/24 hours

$p < 0,05$



■ Open group (OG) = 174 p

■ Laparoscopic group (LG) = 78 p

Results III

	LG= 78	OG = 174
Nr.complications (%)	5 (6,4)	15 (8,6)
Prolonged fever	2	4
Prolonged ileus	1	4
Wound infections	0	6
Suture leaks + subphrenic abscess*	2	0
Postoperative occlusion	0	1
Reoperations (%)	2 (2,5)	1 (0,5)



* simple suture

No mortality!

Surgical technique

- **Simple suture** (1-3 stitches)
- **Omental patch repair(omentoplasty)**
 - **Graham patch** (3 stitches)
 - **Graham-like patch** (1,2,"z" stitches)
 - **Modified Graham patch**
 - **Omentopexy**
- **Fibrin glue repair**

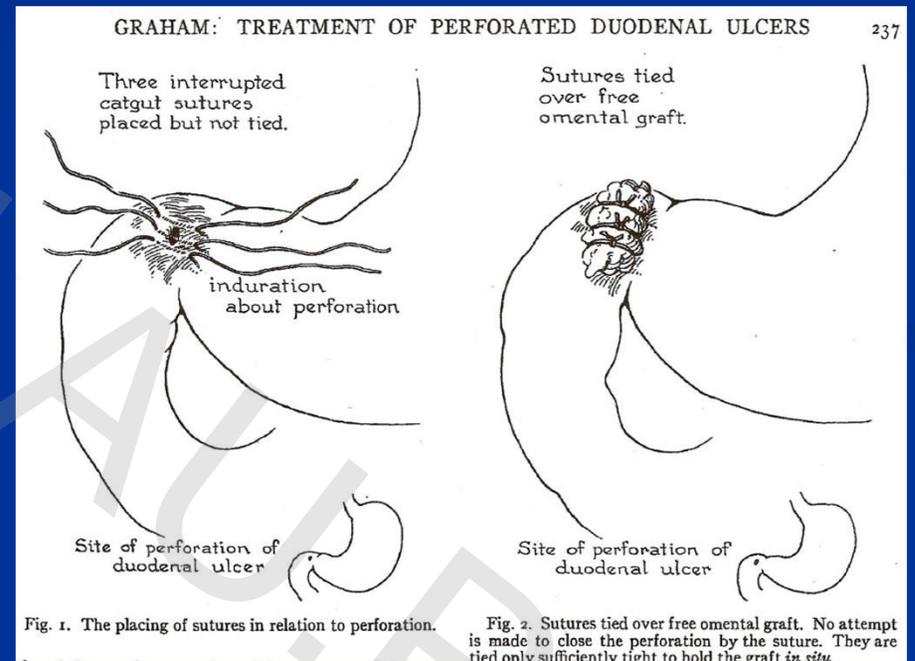


THE TREATMENT OF PERFORATED DUODENAL ULCERS

ROSCOE R. GRAHAM, M.B., F.R.C.S. (C.), F.A.C.S., Toronto, Canada

The procedure which we use could not be more simple: Three interrupted catgut sutures are used. One is placed at the top, one in the middle, and one at the bottom of the perforation (Fig. 1). A piece of omentum, either free or attached, is laid over these sutures, which are then tied just sufficiently tight to hold the omental graft *in situ*, but not with sufficient force to cause the sutures to cut out, even in the most edematous indurated ulcer. No attempt is made actually to close the perforation (Fig. 2).

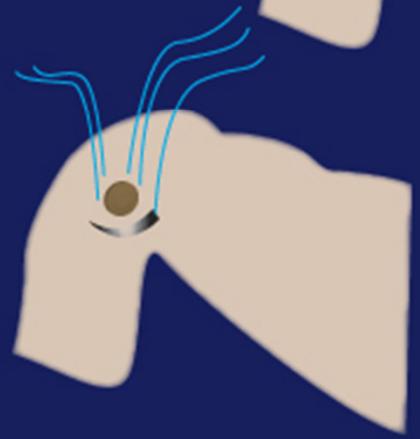
SURGERY
Gynecology and Obstetrics
An International Journal of Surgery
Volume 64
JANUARY TO JUNE, 1937



Graham
Graham
like/patch

Modified
Graham patch

Omentopexy



Graham patch

Omentopexy



Surgical technique (20 studies)

Surgeon's position	44% between legs	33% left side
Pneumoperitoneum	47% Veress	26% Hasson
Camera	80% 30°	10% 0°
Camera position	30% umbilical	30% supraumbilical
Number of trocars	60% four	40% three
Suture material	64% absorbable	36% non-absorbable
Knotting technique	64% intracorporeal	16% extracorporeal
Closure of perforation	66% omental patch	24% mixed 10% situs



- **Insufficient data on surgical techniques to make recommendations but:**
 - extracorporeal knotting is likely to cut through the friable edges of the perforation
 - simple suture may be difficult to perform because of surrounding induration of tissue
 - avoiding omentoplasty might shorten operating time but might be the reason for a higher incidence of leakage

[Lunevicius R, Morkevicius M, Br J Surg, 2005; Bertleff MJOE, Lange JF, Surg Endosc, 2009]



ANIMICOLLAU.RO



How to improve outcome?

- preoperative O₂ treatment (Gr. A)
- preoperative crystalloids and/or colloids (Gr. A)
- early i.v. broad spectrum antibiotics (Gr. C)
- increased (invasive) levels of monitoring (Gr. B)
- SIRS/sepsis screening to treat postoperative complications early (Gr. A)
- postoperative admission to a HDU (Gr. A)
- sufficient postoperative nutrition (Gr. B)



Emergency operations for residents

- Laparoscopic cholecystectomy for acute cholecistitis
- Laparoscopic appendectomy
- Adhesiolysis
- Closure of PPU
- Diagnostic laparoscopy



Conclusions

- Diagnostic tool in patients with equivocal clinical and imagistic data
- Laparoscopic suture + H. pylori eradication are safe in PPU therapy
- Boey score is a valuable selection criteria for laparoscopic repair of PPU



- For patients with no or low-risk factors, laparoscopic repair is the intervention of choice
- Further RCT are needed to evaluate the outcome and the benefits of laparoscopic repair especially concerning surgical technique, morbidity and mortality



In the era of *Helicobacter pylori*, doing a gastrectomy for peptic ulcer is like doing a lobectomy for pneumonia

Asher Hirshberg

THANK YOU



- 1995, Georgescu Ş
- 1998, 2002, Nicolau AE
- Palade R, Târcoveanu E, Pantea S, etc

EAES consensus statement

Surg Endosc (2006) 20: 14–29
DOI: 10.1007/s00464-005-0564-0

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and Other Interventional Techniques

Laparoscopy for abdominal emergencies

Evidence-based guidelines of the European Association for Endoscopic Surgery

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Table 2. Randomized and nonrandomized controlled trials comparing laparoscopic and open repair for perforated gastroduodenal ulcers^a

Study, year	LoE	No. of patients	Leakage rates (%)	Total complication rates (%)	Difference in hospital stay (d)
Lau et al., 1996 [153]	1b	48/45	2/2	23/22	±0 n.s. ^b
Siu et al., 2002 [246]	1b	63/58	2/2	25/50	-1 sign. ^c
Johansson et al., 1996 [119]	2b	10/17	10/7	30/20	-1 n.s. ^b
Sø et al., 1996 [250]	2b	15/38	0/0	7/24	-2 n.s. ^b
Miserez et al., 1996 [74, 185]	2b	18/16	NA	50/9	-1 n.s. ^b
Chung et al., 1998 [57]	2b	3/3	NA	NA	-4 sign. ^c
Kok et al., 1999 [135]	2b	13/20	NA	8/15	-1 n.s. ^b
Næsgaard et al., 1999 [191]	2b	25/49	4/0	28/14	±0 n.s. ^b
Bergamaschi et al., 1999 [21]	2b	17/62	0/0	29/34	-2 n.s. ^b
Mehendale et al., 2002 [180]	2b	34/33	0/0	3/6	-5 sign. ^c
Lee et al., 2001 [155]	3b ^d	155/219	13/2	NA	-1 n.s. ^b
Nicolau et al., 2002 [202]	3b ^d	51/105	0/0	6/7	-2 sign. ^c
Seelig et al., 2003 [240]	3b ^d	24/31	4/3	13/26	-2 n.s. ^b
Tsumura et al., 2004 [272]	3b ^d	58/13	NA	5/23	-12 sign. ^c
Lam et al., 2005 [148]	3b ^d	523/1737	NA	3/13	-3 sign. ^c

Results I

	GLS = 78	GSD = 174
Mean age (years)	30,3	30,9
Sex F/M (%)	4/74 (5,1/94,9)	23/151 (13,2/86,8)
Leukocytes/mm ³	13342	14796
Ulcer history (%)	10(12,8)	26(14,9)
Time onset-surgery (hours)	9,5	10,5
ASA I-II (%)	75 (96,2)	163 (93,7)
ASA III (%)	3 (3,8)	11 (6,3)
Perforation > 5 mm (%)	6(7,6)	19(10,9)
Pneumoperitoneum (%)	63 (80,7)	135 (77,5)
Air-fluid levels (%)	-	6 (3,4)

p>0,05

- 1995 February - 2005 March; prospective, nonrandomized study
- LSG (laparoscopically sutured group) = 78
- OSG (open sutured group) = 174
- Conversions: 5 (fragility of duodenal edges in 3 cases, accidental enterotomy, suture leak)
- Modified initial diagnosis (OSG): 5 (appendicitis)
- Suture:
 - Simple
 - omentopexy

- 3 RCT (n=325)

Author	LG (N=)	OG (N=)
W.Y.Lan (1996)	52	51
W.T Siu (2002)	58	63
M.Y. Bertleff (2004)	52	49

Laparoscopic versus open repair 2009 review of literature (n=1872)

+ Laparoscopy:

- ❖ Hospital stay 6,3 vs 10,3 days
- ❖ Morbidity 14,3% vs 26,9%
- ❖ Mortality 3,6% vs 7,2%
- ❖ Normal activity 12,7% vs 16,6 days
- ❖ Wound infections 0 vs 5%
- ❖ VAS day 3,8 vs 6,4
- ❖ Better postoperative outcome: nasogastric tube, i.v. fluids, normal diet, drain etc.

- Laparoscopy:

- ❖ Operating time 70,8 vs 59,3 min
- ❖ Suture leakage 6,3% vs 2,6%

- Only 2 randomized studies:
 - Lau WY (Ann Surg, 1996), Liu WT (Ann Surg, 2002)
- 2005 metanalysis
 - ⊕ less analgesic use, wound infections, hospital stay, morbidity
 - ⊖ operating time, suture leaks, intraabdominal abscesses, reoperations
 - Laparoscopic suture-closure seems better for low-risk patients.

[Lunevicius R, Morkevicius M, 2005, World J Surg]

- *Data about analgesic needs, oral food intake and hospital stay (3 vs 13 days) were non-homogenous*

Risk factors associated with unsuccessful laparoscopic repair

Boey risk factors:

- Shock on admission (TAs < 100 mmHg)
 - Delayed presentation (> 24h)
 - Underlying severe medical illness (ASA III/IV)
-
- Age > 70 yo
 - APACHE II > 5
 - Expertise in laparoscopic surgery

When is conversion indicated?

1. Purulent peritonitis (delayed presentation)
2. Hemodynamic instability
3. Abdominal distention
4. Fragility and infiltration of ulcer edges
5. Perforation \geq 6-10 mm
6. Posterior perforated ulcer

[Nicolau AE, Chirurgie laparoscopică de urgență, CNI Coresi, 2004; Lunevicius R, Morkevicius M, Surg Endosc, 2005]

■ Problems

- Peritonitis influences the recovery and the benefits of laparoscopic approach
 - **Septic shock** ⇒ **absolute contraindication**
 - Experimental studies:
 - capnoperitoneum increases risk of infections in case of prolonged peritonitis (>12 h)
 - evidence-based clinical data are lacking

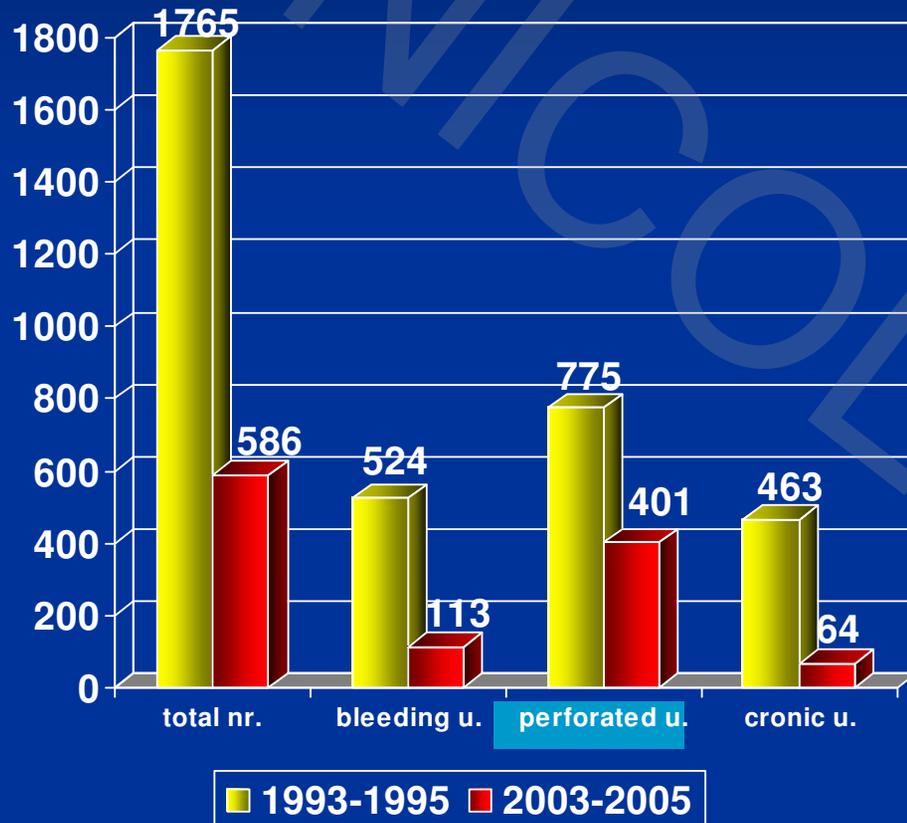
[Navez B, EAES Congress, 2009]

- **Cardio-pulmonary comorbidities: relative contraindication**
- **Concomitant ulcer stenosis/bleeding** ⇒ **definitive surgery**
- **For the high-risk patients is better to choose the open repair?**

- 1992 - in perforated duodenal ulcer (PDU) there were five therapeutic decisions:
 - 1) Whether an operation is to be performed
 - 2) Whether a plication - omental patch or definitive operation is necessary
 - 3) Whether the patient is stable enough to undergo a definitive operation
 - 4) Which definitive operation is indicated
 - 5) Whether the availability of new antacid agents should influence the choice of operation

[Feliciano DV, 1992, Surg Clin N Am]

Interventions for GDU



No. of cases variation

- total nr. -66,79%
- chronic u. -86,17%
- bleeding u. -78,43%
- perforated u. -48,25%

	Average nr. of op/year	
	1993-1995	2003-2005
total nr.	588	195
chronic u.	174	38
perforated u.	258	134
bleeding u.	154	21

How to improve outcome?

- eradication therapy of *H. pylori* infection
- antisecretory therapy PPI 4-8 weeks

[Moller MH et al, Scand J Gastroenterol, 2009]

Laparoscopic versus open repair: review of literature (n=1872)

+ Laparoscopy:

- ❖ Hospital stay 6,3 vs 10,3 days
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- Laparoscopy:

- ❖ Operating time 70,8 vs 59,3 min
- ❖ Suture leakage 6,3% vs 2,6%

- Sept. 2006, Bergamaschi R (EAES Congress):
 - Insufficient data on surgical technique to make recommendations
 - Analgesic requirements, resumption of oral intake, length of stay are surrogate outcome measures
 - Clinical endpoints: leak, evisceration, death
 - Laparoscopic approach is advantageous in the hands of an experienced surgeon

AMNICOLOLAU.RO

Ulcer perforat