

**6th INFECTIOLOGY TODAY**  
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Presidente: Maurizio Mazzeo

***Le Infezioni delle Protesi della Parete Addominale***

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# Haernia Operations per/year in Italy

210.000

170.000 GROIN HAERNIA

40.000 VENTRAL HAERNIA

20.000 Primary



20.000 Incisional

# CLASSIFICATION of SURGICAL OPERATIONS, THEORIC INCIDENCE of S.S.I. and ANTIBIOTIC PROPHYLAXIS

C.D.C.-Atlanta- 1999

CLASS	DEFINITION	EXAMPLE	S.S.I.	ANTIBIOTIC PROPHYLAXIS
I <sup>^</sup>	CLEAN	Haernia, Thyroid	0-1%	No
II <sup>^</sup>	CLEAN-CONTAMINATED	Gallbladder, Stomach	2-3%	Yes in High Risk PTS
III <sup>^</sup>	CONTAMINATED	Colon, Rectum	10-15%	Necessary
IA <sup>^</sup>	DIRTY	Peritonitis	20-25%	Therapy

INCIDENCE OF S.S.I ARE MEAN VALUES UNRELATED TO EVENTUAL RISK-FACTORS

## *...but a «confounding» factor has changed the biological scenario of groin and ventral haernia surgery...*

- ...Mesh hernioplasty is the preferred surgical procedure for large abdominal wall hernias...
  - ...Open tension-free hernioplasty using prosthetic meshes dramatically reduced recurrence rates after hernia or incisional hernia repair and has become the rule...
  - ...In recent years, use of prosthetic material for inguinal hernia repair has increased dramatically...
  - ...Prosthetic mesh has become the standard method for hernia repair...
  - ...The preferred treatment for incisional hernias occurring post laparotomy involves use of prosthetic mesh...
  - ...Mesh hernioplasty is the preferred surgical procedure for large abdominal wall hernias. Infection remains one ...
- 
- [J Am Coll Surg](#). 2005 Mar;200(3):393-7
  - [Hernia](#). 2012 Aug;16(4):445-9
  - [J Laparoendosc Adv Surg Tech A](#). 2010 Apr;20(3):249-52
  - [J Am Coll Surg](#). 2014 May;218(5):960-8.
  - [Ostomy Wound Manage](#). 2006 Jan;52(1):52-4.
  - [J Laparoendosc Adv Surg Tech A](#). 2010 Apr;20(3):249-52

Has the «foreign-body-mesh» increased the incidence of S.S.I.?

**Probably yes**

If yes, is a systematic antibiotic prophylaxis recommended?

[Enferm Infecc Microbiol Clin.](#) 2001 Mar;19(3):107-13. **Antibiotic prophylaxis and hernia repair. Systematic quantitative review results** [Javier Sánchez-Manuel F<sup>1</sup>](#), [Luis Seco-Gil J](#), [Lozano-García J](#).

- The usefulness of the antibiotic prophylaxis in hernia repair is currently a controversial subject
- Antibiotic prophylaxis in hernia mesh repair diminishes the rate of infection by 61% ( $\approx 1/2 \times \%$ )
- Antibiotic prophylaxis in hernia mesh repair is useful in preventing wound infection

*Antibiotic prophylaxis in hernia repair is useful in preventing wound infection. Nevertheless, **this does not imply its indiscriminate administration**, rather it is necessary to base it on the local rate of wound infection and on the analysis of the patients' risk factors in order to avoid its administration when the possible benefit is considered to be limited.*

[Cochrane Database Syst Rev. 2003;\(2\):CD003769.](#)

## **Antibiotic prophylaxis for hernia repair.**

[Sanchez-Manuel FJ](#) [Seco-Gil JL](#).

CASES	N°	%S.S.I.	NO MESH	MESH
TOTAL	2660	2.92%	-	-
PROPHYLAXIS	1297	3.08%	3.78%	1.30%
NO PROPHYLAXIS	1363	4.69%	4.87%	4.20%

Based on the results of this meta-analysis, there was no clear evidence that routine administration of antibiotic prophylaxis for elective inguinal hernia repair reduced infection rates, even though hernia-mesh-pts has 3% reduction of S.S.I.

[Cochrane Database Syst Rev.](#) 2004 Oct 18;(4):CD003769.

## **Antibiotic prophylaxis for hernia repair.**

[Sanchez-Manuel FJ](#) [Seco-Gil JL](#).

CASES		% S.S.I.	NO MESH	MESH
TOTAL	2907	2.46%		
PROPHYLAXIS	1421	2.88%	3.78%	1.20%
NO PROPHYLAXIS	1486	4.30%	4.87%	3.30%

ANTIBIOTIC PROPHYAXIS SEEMS TO BE MORE EFFICIENT IN PTS WHO HAD A MESH HAERNIA REPAIR  
BUT IT IS RATHER STRANGE THAT NO-MESH-NO-PROPHYLAXIS PTS DO WORSE THAN MESH-PTS

[Ann Surg.](#) 2004 Dec;240(6):955-60

**The role of antibiotic prophylaxis in prevention of wound infection after Lichtenstein open mesh repair of primary inguinal hernia: a multicenter double-blind randomized controlled trial.**

[Aufenacker TJ](#)<sup>1</sup>, [van Geldere D](#), [van Mesdag T](#), [Bossers AN](#), [Dekker B](#), [Scheijde E](#), [van Nieuwenhuizen R](#), [Hiemstra E](#), [Maduro JH](#), [Juttmann JW](#), [Hofstede D](#), [van Der Linden CT](#), [Gouma DJ](#), [Simons MP](#).

- 1040 pts
- Double-blind randomized controlled trial
- 9 S.S.I. antibiotic prophylaxis group
- 10 S.S.I. control group
- Absolute risk reduction 0.19-0.20%
- Numer needed to treat >500 for a total number of infections

IN LICHTENSTEIN INGUINAL PRIMARY HERNIA REPAIR, ANTIBIOTIC PROPHYLAXIS IS NOT INDICATED



# Randomized Trials and/or Meta-Analysis Antibiotic Prophylaxis vs Placebo

AUTOR	YEAR	PTS	PROPHYLAXIS	CONTROLS	P
Perez, AR	2005	360	1.7%	3.3%	0.50
Aufenacker, TJ	2006	2507	1.8%	3.6%	0.54
Sanchez-Manuel,FJ*	2007	6705	2.9%	3.9%	0.64
Shankar, VG	2010	450	<b>7.0%</b>	<b>10.5%</b>	0.75
Yin, Y	2012	3318	2.4%	4.1%	0.61
Sanchez-Manuel, FJ	2012	7843	3.1%	4.5%	0.64
Mazaki, T	2013	1902	3.0%	<b>6.0%</b>	0.49
Mazaki, T	2014	200	2.0%	<b>13.0%</b>	0.03

**BASED ON THE RESULTS...THE ADMINISTRATION OF ANTIBIOTIC PROPHYLAXIS FOR ELECTIVE INGUINAL HERNIA REPAIR CANNOT BE UNIVERSALLY RECOMMENDED. NEVERTHESS, ITS ADMINISTRATION CANNOT EITHER BE RECOMMENDED AGAINST WHEN HIGH RATES OF INFECTION ARE OBSERVED**

# HAERNIA MESH-REPAIR F.B.F.-ROMA 2009-2013

YEAR	NUMBER	COMPLICATIONS	TYPE	THERAPY
2009	350	8(2.2%)	URINARY 5 HAEMATOMA 2 INFECTION 1	→FOLEY(+Fluorochilons) →DRAINAGE, <i>Enterococcus spp</i> →MESH REMOVAL, <i>S.aureus</i> →Targosid
2010	350	6(1.7%)	URINARY 4 HAEMORRHAGE 2	→FOLEY(+Fluoroquinolons) →DRAINAGE and HAEMOSTASIS
2011	329	3(0.9%)	URINARY 1 HAEMATOMA 2	→FOLEY(+Fluoroquinolons) →DRAINAGE, <i>S.aureus</i>
2012	330	3(0.9%)	URINARY 2 HAEMATOMA 1	→FOLEY(+Fluoroquinolons) →DRAINAGE, <i>S.aureus</i>
2013	357	5(1.4%)	URINARY 2 HAEMATOMA 3	→FOLEY(+Fluoroquinolons) →DRAINAGE, <i>S.aureus</i> , <i>E.coli</i>

ALL OUR PTS RECEIVE ULTRA-SHORT PROPHYLAXIS, either a protect-Penicillin or Cefazoline

# PROSTHETIC INFECTION (1-2d →1-2yrs) AFTER INGUINAL HAERNIOPLASTY:

## 1-Risk Factors

## 2-Microbiology

## 3-Therapy

1: Smoking, COPD, Age, Obesity, Diabetes, Immunosuppression, Emergency surgery, Surgery time, ASA score

2: *Staphylococcus aureus* 50-60%

*Staphylococcus spp* 10-20%

*Enterococcus spp* 10-20%

*Gram-neg* 5-10%

*Pseudomonas, Streptococcus spp, Mycobacteria spp, mixed flora rare*

3: 70-80% Mesh removal: *low incidence of recurrence*

20-30% Conservative treatment: *antibiotics(+drainage?+VAC?)*

# Is the problem similar for ventral haernia?

- 32 pts with infection after prosthetic repair
- 22 meshes totally removed
- 10 meshes partially removed
- 51 operations required
- 6 recurrence of haernia
- 2 fistulas of the bowel

*Tolino, MJ Hernia 2009;13;631*

*...because...*

*...the «foreign body» represented by the mesh and the suture stitches have a surface which is bigger than required for repairing an inguinal haernia...*

*For instance, one Vicryl-1, 70cm long, develops a surface of 130cm/q*

[World J Surg.](#) 2011 Nov;35(11):2389-98

**Risk factors for mesh-related infections after hernia repair surgery: a meta-analysis of cohort studies.**

[Mavros MN](#), [Athanasίου S](#), [Alexiou VG](#), [Mitsikostas PK](#), [Peppas G](#), [Falagas ME](#).

## CRUDE MESH INFECTION RATE

5.0%

GROIN HAERNIA    VENTRAL HAERNIA



0.3%



7.2%

MESH REMOVAL

70%

[Surg Endosc.](#) 2013 Jun;27(6):2221-30

**Postoperative surgical site infections after ventral/incisional hernia repair: a comparison of open and laparoscopic outcomes.**

[Kaoutzanis C](#), [Leichtle SW](#), [Mouawad NJ](#), [Welch KB](#), [Lampman RM](#), [Cleary RK](#).

SURGERY	CASES	RIDUCIBLE	INCARCERATED	Odds Ratios
OPEN	21463	15520	5943	12.4
V.L.S.	5303	3883	1420	11.1
P				<0.01

[Surgery](#). 2013 ;153(1):120-5

**Evaluation of high-risk, comorbid patients undergoing open ventral hernia repair with synthetic mesh.**

[Krpata DM](#), [Blatnik JA](#), [Novitsky YW](#), [Rosen MJ](#).

- OBESITY
- DIABETES
- COPD
- SMOKING
- IMMUNOSUPPRESSION

16% Infections

3% Re-Operation

5% Recurrence

...mean number of co-morbidities per patient was 1.9...

...some patients may be managed conservatively (antibiotics+VAC) with salvage of the prosthesis, especially if macroporous mesh is used...



[Surgery](#). 2014;155(4):702-10

**Risk factors for 30-day readmission in patients undergoing ventral hernia repair.**

[Lovecchio F](#), [Farmer R](#), [Souza J](#), [Khavanin N](#), [Dumanian GA](#), [Kim JY](#).

- American College Surgeon's National Surgical Quality Program 2011:

\*4,9% 30-day readmission:

1. 23% Surgical Site Infection (P<0.001)

2. 10% Sepsis/Septic shock (P<0.001)

→ Smoking habit-->*predictor of readmission*

→ COPD-->*predictor of readmission*

Ventral hernia repair (VHR), an increasingly common procedure, may have a greater impact on health care costs than is currently appreciated. Readmissions have the potential to further increase these costs and negatively impact patient outcomes...Although complications are the main driver of readmission, surgeons must be aware of comorbidities that independently increase the odds of readmission, even when a complication does not occur.

[J Am Coll Surg.](#) 2014 May;218(5):960-8.

**Prophylactic Mesh vs Suture in the Closure of the Umbilical Trocar Site after Laparoscopic Cholecystectomy in High-Risk Patients for Incisional Hernia. A Randomized Clinical Trial.**

[Armañanzas L](#), [Ruiz-Tovar J](#), [Arroyo A](#), [García-Peche P](#), [Armañanzas E](#), [Diez M](#), [Galindo I](#), [Calpena R](#).

PATIENTS	NUMBER	T.S.I.H.	S.S.I.
NO-MESH	47	<b>31.9%</b>	<b>8.5%</b>
MESH	45	4.4%	0%
P		<0.001	n.s.

T.S.I.H.: Trocar Site Incisional Haernia

Prosthetic repair has become the standard method for hernia repair. Mesh placement for the prevention of trocar site incisional hernia (TSIH) is still a controversial issue. We tested the hypothesis that closure with an intraperitoneal prophylactic mesh of the umbilical trocar after a laparoscopic cholecystectomy can reduce the incidence of a TSIH in high-risk patients...Prosthetic closure of the umbilical trocar site after laparoscopic surgery could become the standard method for preventing TSIH in high-risk patients

# CONTAMINATED VENTRAL HERNIA REPAIR

AUTHOR	CASES	SURGICAL SITE OCCURRENCE	RECURRENCE
ROSEN,MJ	128	47%	31%
CARBONELL,AM	100	30%	7%(4 re-op by emergency)
PINELL-WHITE,XA	82	28%	31%

Ann Surg 203;257:991 J Am Coll Surg 2013;217:991 Ann Plast Surg 2014, Mar 28(Epub ahead of print)

# The battle between biological and synthetic meshes in ventral haernia

A.Montgomery

Hernia 2013; 17:3

Author	PTS	S.S.I.	RECURRENCE	DEATH
Bellows,CF Am J Surg 2012;205:85	1241(Multi-Cent.)	29%	15%	4%
Itani, KM Surgery 2012;152:498	80(Mono-Cent.)	30%	28%	3%

## Comments by A.Montgomery:

- Biological meshes = healthy collagen tissue
- Possible risk of early degradation by collagenase
- Most patients with ventral haernia have impaired collagen synthesis, so the production may be scanty
- Huge price difference between synthetic and biological meshes, 1-5/1-10
- Ideal position in retromuscular compartment standing the high vascularization
- High risk of S.S.I. → potential advantage for biologic mesh
- Previous wound infection → potential advantage for biologic mesh
- Contaminated setting → biological mesh, retromuscular, fascia closure on the top of the mesh

# VENTRAL HAERNIA MESH-REPAIR F.B.F.-ROMA 2009-2013

YEAR	CASES	S.S.O.	DIAGNOSIS	THERAPY
2009	63(35 VLS)	-	-	-
2010	83(61 VLS)	1	Perforation Left Colon(VLS)	→Re-Lap+Colostomy+Mesh off, <i>E.coli</i>
2011	83(60 VLS)	5	1-Haematoma 1-Haematoma 1-Seroma 1-Perforation Ileum (VLS) 1-Haemorrhage	→Conservative →Ligation epigastric vessels+Mesh off, <i>S.aureus</i> →Conservative →Re-Lap+Resection+Mesh off, <i>Enterococcus spp</i> →Re-Lap+Haemostasis
2012	72(33 VLS)	3	1-Metabolic 1-Urinary 1-Infectious Mononucleosis	→Conservative →Re-Admission →Re-Admission
2013	70(27 VLS)	3	1-Acute Renal Failure 1-Haematoma 1-Seroma	→Death →Re-Lap+Haemostasis →Re-Admission, <i>S.aureus</i>
			VLS: Videolaparoscopy	S.S.O.: Surgical Site Occurrence

ALL THE PTS RECEIVED PRE- POST- ANTIBIOTIC PROPHYLAXIS, USUALLY EXTENDED FOR 24 HRS

# SUMMARY

- Prosthetic mesh has become the standard method for hernia repair
- The «foreign-body-mesh» has increased the incidence of S.S.I.
- S.S.I. incidence appears related to the dimension of the mesh→the bigger the mesh,the worse the complications
- Macroporous mesh are better than microporous→better migration WBC and macrophages
- Pts risk factors: age, BMI, COPD, diabetes, smoking, immunosuppression
- Surgeon risk factors: expertise, surgery time, surgery type(scheduled or emergency)
- Antibiotic prophylaxis in hernia repair is currently a controversial subject
- 1% SSI means over-treatment-antibiotic-prophylaxis of 99pts
- Mesh infection may be a dramatic task to manage, especially in ventral haernia repair
- Correction of *a priori* contaminated abdominal wall defects is even worse→biological mesh?
- The problem is clinical and legal→reimbursement claims
- *Microbiology is mainly represented by S.aureus but Enterobacteria and mixed flora are not rare*
- Treatment of SSI may be conservative→antibiotics+drainage+VAC(?)
- In the majority of cases the mesh should be removed; in ventral haernia may be required more than one re-operation
- The usual, but not standard consequence, is the recurrence of the haernia, especially in case of ventral haernia

# PREVENTION of MESH INFECTION

- One-shot antibiotic prophylaxis (protected-penicillins or cephalosporins I<sup>^</sup> generation) is useful
- Antibiotic prophylaxis may be omitted in young-thin-healthy pts
- Surgery-time should be reduced as much as possible (expertise of the surgeon)
- The extent of dissection should be limited
- Any dead-tissue should be eliminated
- Haemostasis should be perfect → blood is a fantastic *pabulum* for bacteria
- Any contact between skin and mesh should be avoided → *S.aureus*
- Antibiotic irrigation of the mesh before insertion seems useless (*Surg Gynec Obst* 1992;175:569)
- Topical povidone-iodine applied inside the wound seems useless (*Eur J Surg* 2001;167:453)
- Nurse and surgeons should change gloves before touching the mesh
- Probably, the mesh should be fixed with glue to reduce the effect-foreign-body

...one moment of thought...

*...a surgeon can aid much more mankind  
operating well an haernia than a tumour...*

George Crile (Cleveland 1864-1943)