

## Is Prosthetic Repair of the Abdominal Wall in Clean-Contaminated Surgical Interventions Possible?

D. Ion<sup>1,2</sup>, R.V. Stoian<sup>1,2</sup>, A. Bolocan<sup>1,2</sup>, A. Cucu<sup>2</sup>, M.B. Serban<sup>1,2</sup>, D.N. Paduraru<sup>1,2</sup>

<sup>1</sup>3<sup>rd</sup> General Surgery and Emergency Department, Bucharest University Emergency Hospital, Romania

<sup>2</sup>“Carol Davila” University of Medicine and Pharmacy, Bucharest, Romania

### Rezumat

#### *Este posibilă protezarea peretelui abdominal în operațiile curate-contaminate?*

Studiul de față încearcă să dea un răspuns nuanțat, personalizat la întrebarea din titlu. Cercetarea se bazează pe o experiență de 10 ani (2000-2009), evaluată retrospectiv pe 488 de hernii incizionale operate protetic, dintre care 432 s-au desfășurat într-un mediu curat și 56 de cazuri într-un mediu curat-contaminat. Cele două loturi sunt superpozabile pe baza scorului Apache. Operațiile viscerale asociate chirurgiei defectului parietal au fost variate. (Colecistectomie, Apendicectomie, Enterectomie/Enterorafie, Colectomie/Colotomie-colorafie, Histerectomie cu anexectomie). Evaluarea complicațiilor supurative postoperatorii nu a arătat diferențe semnificative între cele două loturi ( $p < 0,001$ ). Aceste rezultate ne conduc la ideea nuanțării indicației de protezare parietală în mediul contaminat. Factorii majori ai acestei decizii sunt: natura, sursa și cantitatea inoculului septic, durata expunerii, intensitatea răspunsului inflamator al gazdei (mai greu de cuantificat), și nu în ultimul rând raționamentul chirurgical. Acesta din urmă va evalua datele de mai sus și va ține cont că nu orice contaminare bacteriană este urmată obligatoriu de o infecție constituită. Se vor evita astfel exagerările în plus care ar însemna precauție inutilă și ineficientă și exagerările în minus care ar însemna temeritate hazardantă.

**Cuvinte cheie:** protezare, perete abdominal, operații curate, operații contaminate

### Abstract

The present study tries to provide an expressive, customized answer to the question in the title. The study relies on a ten-year experience (2000-2009), evaluated retrospectively on a group of 488 prosthetic repairs of incisional herniae, out of which 432 were performed in a clean environment and 56 cases in a clean-contaminated one. The two groups are superimposable based on the Apache score. The visceral surgical procedures associated to the surgery of the parietal defect were varied (cholecystectomy, appendectomy, enterectomy/enterorrhaphy, colectomy/ colotomy-colorrhaphy, hysterectomy with adnexectomy). The assessment of postoperative suppurative complications showed no significant differences between the two groups ( $p < 0.001$ ). These results lead us to the idea of defining the indication for parietal prosthetic repair in a contaminated environment. The major factors of this decision are: the nature, the source and the amount of the septic inoculum, the duration of exposure, the intensity of the host inflammatory response (more difficult to quantify), and finally the surgical judgment. The last mentioned factor will evaluate the above-mentioned data and will take into account that not all bacterial contaminations are necessarily followed by an established infection. Thus, additional exaggerations - which would mean taking useless, ineffective precautions - as well as negative exaggerations - which would mean hazardous boldness - will be avoided.

---

Corresponding author: Alexandra Bolocan, MD  
The University Emergency Hospital  
The General Surgery Department and  
Emergency III, Bucharest  
Splaiul Independenței, no.169, România  
E-mail: bolocan.alex@gmail.com

**Key words:** prosthesis, abdominal wall, clean surgeries, contaminated surgeries

---

## Introduction

Parietal prosthetic repair represents today the optimal solution for most incisional herniae. (1,2)

Postoperative suppuration remains the most common and most feared complication of these interventions, and this is why a wide range of measures to prevent it were proposed.

In this sense, the presence of an intraoperative bacterial contamination represents a formal contraindication for prosthetic repair. Actually, there are many clinical situations which require solving the parietal-abdominal defect while concurrently performing a visceral resection, which involves the association of a septic time.

The surgical indication may come either from the parietal defect or from the visceral injury, or from the two entities which overlap (the necrotic loop in the eventration sac).

## Material and Method

The present study aims to explore comparatively the rate of the septic postoperative complications, at the parietal level, between two groups:

- Group I prosthetic repairs of incisional herniae without contamination of the operating field - 432 patients;
- Group II prosthetic repairs of incisional herniae in an operating field with limited and controlled contamination - 56 patients.

The study has a retrospective, single-centric character, evaluating a casuistry of 494 operated incisional herniae over a period of 10 years (2000-2009).

In the overwhelming majority, 432 cases (87.4%) the surgical intervention had a clean character, adequate to the ideal desideratum of the parietal prosthetic repair.

A total of 62 surgical interventions (12.6%) were performed in a clean-contaminated field, so that in 56 cases (90.3%) the parietal prosthetic repair was performed, and in 6 cases (9.7%) the massive contamination contraindicated the prosthetic repair. The patients were operated on by the same team, in the same department, with the same type of prosthesis (polypropylene or dual mesh), by performing two procedures (SubLay and InLay). Although unequal in point of number, the two groups are superimposable in terms of age and associated pathology, through the evaluation based on the Apache score. The Apache score for these 56 patients ranged between 2 and 4, with an average of 2.5, and the age ranged between 44 and 78, with an average of 64.3 years. In group I the Apache score ranged from 2 to 4, with an average of 2.75, and the age ranged between 45 and 80 years with an average of 64.1 years.

In the overwhelming majority of cases, the polypropylene prosthesis was placed at the properitoneal, retromuscular level in the Stoppa Repair manner (416 respectively 50 cases), and in 16 respectively 6 cases, a prosthetic substitution was performed with a dual-mesh prosthesis placed intraperitoneally.

**Table 1.** Comparative overview of the groups in terms of age and the Apache score

|                        | Age range | Average age | Apache score limits | Average Apache score |
|------------------------|-----------|-------------|---------------------|----------------------|
| Group I (432 patients) | 45-80     | 64.1        | 2-4                 | 2.75                 |
| Group II (56 patients) | 44-78     | 62.3        | 2-4                 | 2.5                  |

**Table 2.** Technical methods for prosthetic placement

|               | Retromuscular, properitoneal procedure | Prosthetic substitution with dual mesh |
|---------------|--|--|
| Group I (432) | 416 (96.3%)                            | 16 (3.7%)                              |
| Group II (56) | 50 (89.2%)                             | 6 (10.8%)                              |

**Table 3.** Visceral surgeries performed in group II

| Visceral surgeries associated to the surgery of the parietal defect | Number of surgical interventions (total 56)                     |
|---|---|
| Cholecystectomy   | 14  |
| Appendectomy  | 8   |
| Enterectomy/Enterorrhaphy   | 18  |
| Colectomy/Colotomy-Colorrhaphy                                      | 4 cancer, diverticulosis<br>2 sidolicosigmoid 2,<br>polyposis 2 |
| Hysterectomy with adnexectomy                                       | 6   |

**Table 4.** Surgical interventions for which we considered the concomitant prosthetic repair to be inappropriate: 6 cases

| Visceral surgeries associated to the surgery of the parietal defect | Number of surgical interventions |
|---|----------------------------------|
| Pelvipерitonitis  | 1                                |
| Colon perforation   | 1                                |
| Perforated duodenal ulcer   | 2                                |
| Acute gangrenous cholecystitis                                      | 1                                |
| Intervisceral abscess   | 1                                |

## Results

The postoperative evaluation was performed after one month and after one year with similar percentages for the two groups:

Superficial infections occurred mainly during the early postoperative period (the first 10-14 days), they generally evolved in the subcutaneous dead space associated to a serohematic collection and had a favourable evolution after the application of conservative measures.

No particular features regarding the evolution of these

**Table 5.** Postoperative follow-up rate

|          | The postoperative follow-up rate after one month | The postoperative follow-up rate after one year |
|----------|--|---|
| Group I  | 90%  | 78%   |
| Group II | 92%  | 82%   |

infections were recorded between the two groups. The deep, juxtaprosthesis infections, with an important local and general response required the wide opening of the prosthetic bed, repeated antiseptic lavage in the focus, targeted antibiotic therapy and exhibited a favourable slow progress during an interval which varied between 3 and 8 weeks.

In a single case in group I the infection had a major lingering character which required a major reintervention after 8 months postoperatively, with the partial removal of the prosthesis, during which a granuloma caused by a multifilament suture remaining from the preceding prosthetic intervention was found.

## Discussions

Bacterial contamination has long been the most feared complication of parietal prosthetic repair. The knowledge accumulated during more than 40 years of using prostheses allowed the analysis of the accumulated data in several directions:

1. The contamination of the abdominal cavity with microorganisms is not necessarily followed by the establishment of an intraabdominal infection (3). Most of the authors agree that an interval of at least 12-24 hours is required for an intraabdominal bacterial contamination to become an established infection (3).

The determining parameters for the passage from contamination to an established infection are:

- The nature of the septic inoculum;
- The amount of the septic inoculum;
- The duration of the exposure to germs.

For the surgical rationale regarding the prosthetic or non-prosthetic repair in the case of an intraoperative peritoneal contamination, these parameters were the most important. Although these parameters are assessed by the surgeon in a subjective manner due to the limited decision-making time, nevertheless the experience of the operating team seems to be the decisive factor in this instance.

2. The characteristics of the prosthetic material are decisive in the case of a contaminated surgical intervention. In this respect, the current standards require the mandatory use in such situations of monofilament macroporous prostheses, and absolutely contraindicate multifilament microporous ones. This requirement is strongly supported by experimental and clinical arguments whose unanimous conclusion is that in the case of a bacterial contamination of a prosthesis its cleansing and the scarring with the prosthesis in place can be obtained if the prosthesis is from the first category (4).

3. A separate discussion must focus on the cancellation

**Table 6.** Parietal suppurative complications

|          | Superficial infections | Deep infections |
|----------|------------------------|-----------------|
| Group I  | 3.24 % - 14 cases      | 3 % - 13 cases  |
| Group II | 3.57 % - 2 cases       | 3.57% - 2 cases |

of the temporary stomata (ileo-colostomy), followed by the prosthetic repair of consecutive parietal defects, where the suppurative prosthetic risk is comparable to that of the prosthetic repair in an uncontaminated environment.

4. In our cases a rather clear distinction was made between the contamination which preceded the surgical intervention and the one occurring concomitantly with the surgical intervention. In our opinion, this is the fundamental landmark for the decision to perform a parietal prosthetic repair even in a contaminated environment. The positive exaggerations would mean taking useless and ineffective precautions, and the negative exaggerations would mean hazardous boldness.

5. The additional surgical gestures in these cases are within the indicated limits for any contaminated surgery, other asepsis and antiseptics measures seeming excessive and unnecessary.

In this sense, we do not subscribe to the measures recommended by other authors (5): the primary dissection of the parietal layers, antiseptic lavage, intraperitoneal antibiotic therapy.

6. The problem of prosthetic or non-prosthetic repair in a contaminated environment needs to be discussed and clarified.

It is desired to define a series of objective criteria meant to minimize the risk of placing these patients in a "gray area" situated at the limit between contamination and established infection.

## Conclusions

1. Parietal prosthetic repair in a contaminated environment is possible in terms of a balanced clinical judgment, well coded surgical gestures and an adequate prosthetic material. In this context monofilament materials are mandatory (mesh and fixation sutures).
2. Septic complications, although possible, are not more frequent as against the cases in which there was no septic time. These complications are related to a number of factors which are incompletely mastered, and which are probably equally related to the field and the alloplastic material.
3. The equilibrium position between prosthetic and non-prosthetic repair in a contaminated environment is obtained by knowing the coverage area of the notions of "contamination" and "established infection".

Thus, there is a clear-cut distinction between the notion of "contamination of the abdominal cavity" and the "established intraabdominal infection" one.

The Surgical Infection Society Guidelines make this

distinction when stating (3):

The transition from the first to the second state depends on many factors among which the source and amount of the septic inoculum, the duration of the exposure and the intensity of the host inflammatory response, which is more difficult to quantify, should be discussed.

The statistical analysis of the suppurative complications which occurred in the control group of patients for whom the prosthetic repair was not accompanied by a visceral resection shows a close percentage of suppurative complications.

The analysis of the complications occurring in the 56 cases of parietal alloplasty performed in the situation of a contamination caused most often by a visceral resection shows a percentage of suppuration on the prosthesis comparable to the group of alloplasties in which there was no septic visceral time.

The visceral resection performed as a first measure involved a correct assessment of the degree of existing or potential intraoperative contamination with the addition of further measures of antisepsis and asepsis.

## References

1. Cavallaro G, Campanile F, Rizzello M, Greco F, Iorio O, Angelis FD, et al. Laparoscopic incisional hernia repair by lightweight polypropylene mesh with resorbable coating. Technical notes, preliminary results. *Chirurgia (Bucur)*. 2013; 108(3):304-11.
2. Târcoveanu E, Vasilescu A. Surgical treatment of inguinal hernia with peritoneal laparoscopy. *Chirurgia (Bucur)*. 2012; 107(1):95-102.
3. Mazuski JE, Sawyer RG, Nathens AB, DiPiro JT, Schein M, Kudsk KA, et al. The Surgical Infection Society guidelines on antimicrobial therapy for intra-abdominal infections: evidence for the recommendations. *Surg Infect (Larchmt)*. 2002;3(3): 175-233.
4. Gillion JF, Palot JP. Abdominal wall incisional hernias: infected prosthesis: treatment and prevention. *J Visc Surg*. 2012;149 (5 Suppl):e20-31.
5. Campanelli G, Nicolosi FM, Pettinari D, Avesani EC. Prosthetic repair, intestinal resection, and potentially contaminated areas: safe and feasible? *Hernia*. 2004;8(3):190-2.

## Corelation of Lymphocytic Infiltrates with the Prognosis of Recurrent Colo-Rectal Cancer

S.T. Makkai-Popa<sup>1,2</sup>, S. Luncă<sup>2</sup>, G. Dimofte<sup>2</sup>, A. Vrânceanu<sup>1,3</sup>, D. Franciug<sup>4</sup>, I. Ivanov<sup>1,5</sup>, F. Zugun<sup>5</sup>, E. Târcoveanu<sup>6</sup>, E. Carasevici<sup>5</sup>

<sup>1</sup>PhD student – "Grigore T. Popa" University of Medicine and Pharmacy, Iași, Romania

<sup>2</sup>Second Surgical Oncology Department, Regional Institute of Oncology, Iași, Romania

<sup>3</sup>Medical Oncology Department, Regional Institute of Oncology, Iași, Romania

<sup>4</sup>Anatomopathology Department, "St. Spiridon" University Hospital, Iași, Romania

<sup>5</sup>Molecular Biology Laboratory, Regional Institute of Oncology, Iași, Romania

<sup>6</sup>First Surgical Department, "St. Spiridon" University Hospital, Iași, Romania

### Rezumat

#### *Corelația infiltratelor limfocitare cu prognosticul recidivei cancerului colo-rectal*

**Introducere:** Din ce în ce mai multe studii încearcă găsirea de factori de prognostic complementari stadializării TNM, iar studiul infiltratelor inflamatorii pare a fi destul de promițător în acest sens.

**Material și metodă:** Studiul reprezintă o analiză retrospectivă a 23 de piese de rezecție (tumori primare) aparținând pacienților care s-au prezentat în clinica noastră pentru recidive după cancer colo-rectal, pe o perioadă de 2 ani. Pentru fiecare pacient gradul de infiltrare cu celule cd3+, cd4+, cd8+, cd45ro și cd68+, la nivel peritumoral, la nivelul frontului de invazie și intratumoral a fost evaluat, folosind densitatea de celule pozitive și procentul de celule pozitive.

**Rezultate:** O densitate mică de celule cd8+ la nivelul țesutului normal peritumoral a fost asociată în cadrul studiului nostru cu un interval liber de boală lung ( $p=0,009$ ), iar analiza de supraviețuire a demonstrat că abundența infiltratului cu celule cd8+ poate stratifica pacienții în funcție de riscul de recidivă ( $p=0,006$ ). Infiltratele de la nivelul frontului de invazie și

de la nivel intratumoral nu au fost în niciun fel corelate cu intervalul liber de boală.

**Concluzii:** Prezența de celule T-citotoxice la nivelul țesutului normal peritumoral poate fi asociată cu o tumoră agresivă din punct de vedere al riscului de recidivă.

**Cuvinte cheie:** prognosticul recidivei, cancer de colon și de rect, evaluare cantitativă a marcajului imunohistochimic, analiză digitală de imagine, celule T citotoxice

### Abstract

**Background:** Recent studies are focusing on complementary prognostic and predictive markers that could complete the predictive TNM staging and one of the most promising directions is the study of tumor immune infiltrates.

**Materials and methods:** Our 2-year retrospective study includes resection specimens from the primary tumors of 23 patients presenting to our clinic for a local or a distant relapse after colon or rectal cancer. From every primary tumor specimen we obtained immunohistochemically stained slides in order to assess cd3, cd4, cd8, cd45ro and cd68 infiltrates. Digital analysis assessed the density and percentage of positively stained cells in the normal peritumoral tissue, invasive margin and center of the tumor.

**Results:** A small density of cd8 positive cells in the peritumoral region was strongly correlated with a longer disease-free interval ( $p=0.009$ ) and the Kaplan-Meier survival analysis showed that the percentage of cd8+ T cells could be used to

Corresponding author:

Luncă Sorinel, MD  
Second Surgical Oncology Department  
Regional Institute of Oncology  
General Henri Mathias Berthelot Street  
No 2-4, Iași, Romania  
E-mail: sdlunca@yahoo.com