# Comparative study between parietal peritoneum suture and nonsuture in midline laparotomies in rats[1]

## Estudo comparativo entre sutura e não sutura do peritônio parietal nas laparotomias medianas em ratos

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**ABSTRACT**
**Purpose:** Compare the parietal peritoneum suture and nonsuture in midline laparotomies in rats, as for the formation of adhesions. **Methods:** 40 adult albino Wistar rats (20 males and 20 females) underwent a surgery, weighing between 350 and 400 grams. After anesthesia, a midline laparotomy was performed, followed by cavity closure with and without peritoneum suture. After 40 days, the rats underwent a new surgery in order to verify the peritoneum and check if there were any adhesions, and the rats were then sacrificed. **Results:** Statistical analysis showed there was no significant difference between the adhesions occurring or not with peritoneal suture or nonsuture, including in relation to the rats' gender. **Conclusion:** Closing the peritoneum or not does not interfere with the formation of adhesions after midline laparotomies in rats from both genders.
**Key words:** Peritoneum. Adhesions. Sutures. Rats.

**RESUMO**
**Objetivo:** Comparar a sutura e não sutura do peritônio parietal nas laparotomias medianas em ratos, quanto à formação de aderências. **Métodos:** Foram operados 40 ratos albinos Wistar (20 machos e 20 fêmeas), adultos, pesando entre 350 e 400 gramas. Após a anestesia, foi realizada laparotomia mediana seguida de fechamento da cavidade com sutura do peritônio e sem sutura do peritônio. Após 40 dias, os animais foram re-operados para a inspeção do peritônio e a constatação da presença ou não de aderências e, em seguida, sacrificados. **Resultados:** A análise estatística demonstrou que não houve diferença significativa entre a ocorrência ou não de aderências com sutura e não sutura do peritônio, nem com relação ao sexo dos animais operados. **Conclusão:** O fechamento ou não do peritônio não interfere na formação de aderências após laparotomias medianas em ratos de ambos os sexos.
**Descritores:** Peritônio. Aderências. Suturas. Ratos.

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### Introduction

Currently, the surgical technique used by a large number of obstetricians and gynecologists is performed by not closing the visceral and/or the parietal peritoneum. Literature indicates experimental works and observations in humans discussing the issue.

There are a lot of thoughts on what is the best method for the synthesis of the abdominal wall after a laparotomy. One of the issues involved is the variability in the individual answer

to the initial surgical aggression, with a possible formation of adhesions in the scar, which may lead to obstructive abdominal conditions, sometimes with catastrophic consequences[1]. Infertility and pain are other sequels that might occur[2].

Complications are long-term and unpredictable, and adhesions have a great impact in post-surgery over the surgical routine and the hospital resources, resulting in considerable health expenses[2].

Post-surgical adhesions are developed after a trauma to the mesothelium, which is frequently damaged after surgical manipulation and contact with the instruments, strange bodies as suture material, glove dust and dissection. Adhesions result from the normal peritoneum answer during the healing of the wound, and develop from the first five to seven days after the injury[2].

In order to evaluate the possible involvement of the peritoneum in adhesion after laparotomies cases, studies with rats were performed comparing the suture or nonsuture of the peritonium[1,3].

The objective of the work herein was to compare the parietal peritoneum suture and nonsuture in midline laparotomies in rats, regarding the formation of adhesions.

## Methods

The essay was approved by the Animal Experimentation Ethics Committee of the Medical Sciences College of Santa Casa de São Paulo (protocol nº 144), being performed at the Surgical Technical and Experimental Surgery Unit (UTECE, Unidade de Técnica Cirúrgica e Cirurgia Experimental) of the Medical Sciences College of Santa Casa de São Paulo.

Forty adult albino Wistar rats (20 males and 20 females), weighing between 350 and 400 grams, underwent a surgery in the Surgical Technical and Experimental Surgery Unit (UTECE) of the Medical Sciences College of Santa Casa de São Paulo. The animals received food and water *ad libitum*, in an artificial light environment in a 12-hour dark-light cycle. Anesthesia was performed with ketamin (75 mg/Kg) and xilasin (5 mg/Kg) via intra peritoneum. Initially, only the male rats were operated, with midline laparotomy of 4.0 cm, followed by a closure of the abdominal cavity with and without peritoneal suture, alternately.

When the peritoneum was closed, we performed a continuous suture with poligregarpone 25 (Monocryl 4-0). The cavity was closed by approaching the aponeurosis lip by lip with the same string, and the skin with a nylon 4-0 string, in separated stitches.

Then, 20 females underwent a surgery, using the same technique.

After 40 days, the animals underwent a new surgery, and their abdominal cavity was opened through a paramedian incision to the right, parallel to the original one, and two transversal incisions from the edges of the paramedian incision, thus forming a "window" that allowed the inner part of the cavity to be observed, making the verification of the peritoneum and the presence of adhesion easy (Figure 1).

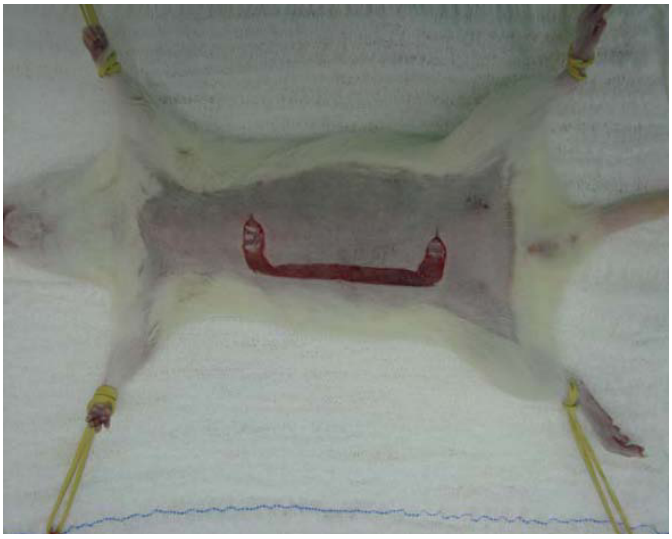

**FIGURE 1 -** Incision used for a new surgery

Wistar rats received a lethal dose of potassium chloride at 19.1% after that surgery still under the anesthetic effect.

For the statistical analysis of this study, the Qui-Square Test was used, and $p < 0.05$ significant values were considered.

## Results

Adhesions found occurred between the epyplon and the peritoneal tissue in the abdominal wall (Figure 2). There was a full reconstitution of the parietal peritoneal tissue in all animals (Figure 3).

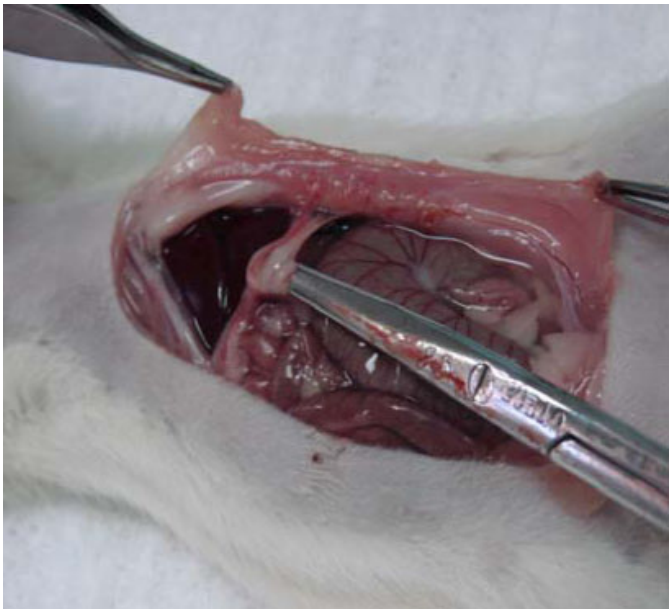

**FIGURE 2 -** Rat 15, group 1 (males)

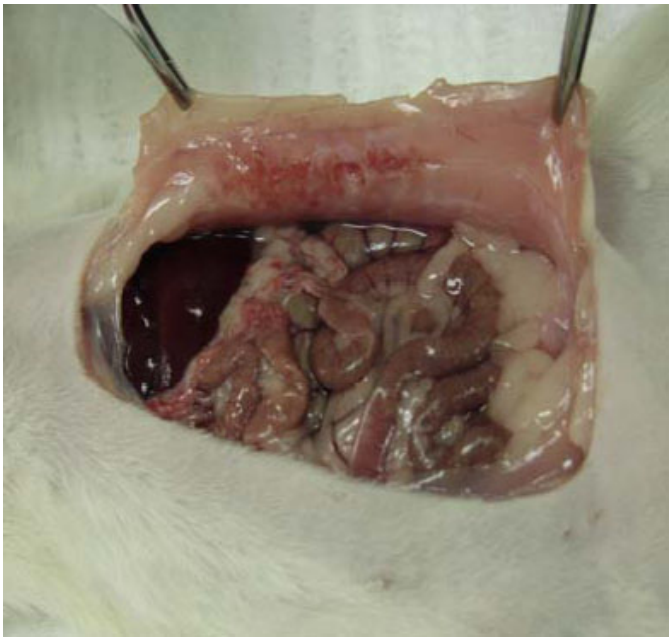

**FIGURE 3 -** Rat 8, group 2 (females)

In the male group, we found more adhesions in animals with peritoneal suture (3 cases) than in animals where the peritoneum was not sutured (2 cases), as well as in the female group, with 8 cases for peritoneal suture, than in animals where the peritoneum was not sutured (4 cases).

The statistical analysis of those results performed through the Qui-Square Test method showed that there were no significant differences between the occurrence of adhesions or not, either with peritoneal suture or nonsuture, neither related to the gender of the rats that underwent surgeries (Table 1).

**TABLE 1 -** Distribution of cases according to the closure of the peritoneum or not, and the presence of adhesions

| | **suture** | **nonsuture** | **total** |
|---|---|---|---|
| with adhesions | 11 | 6 | 17 |
| Without adhesions | 9 | 14 | 23 |
| Total | 20 | 20 | 40 |

$X2 = \Sigma \frac{(|0 - E| - 0,5)}{E}$ $X2 = 1.64$

For a freedom degree level 1, probability is 0.20. Therefore, results are not significant. A $p > 0.05$ value was determined through a Qui-Square Test, so there was no significant difference between the peritoneal closure or not, and the presence of adhesions.

**Discussion**

By studying the bibliography quoted, we realized there is a lot of controversy around that subject and a significant difference between the experimental works and the works performed with human subject observations.

Paradoxally, works on the subject are profusely larger in human observation than animals.

The abdominal cavity is the way for all the celomic surgeries, as well as for most procedures in retroperitoneal areas. As a consequence, incision and suture in the abdominal wall is one of the most common exercises in surgical practice[4].

The basic principle of surgical incision closure is to restore the shape and function of the abdominal wall after surgical procedures[5].

It is suggested that the mass suture, involving the peritoneum and the muscles, comprises a finer technique that suturing the abdominal wall by layers[6,7].

The formation of adhesions during the post-surgery period is a common complication in abdominal surgeries[8], and peritoneal adhesions are the largest cause of morbidity[9].

The study herein aimed at evaluating the influence of both peritoneal suture and nonsuture of rats in the formation of adhesions. Despite the exhaustive bibliographic research, we did not find a significant number of articles in literature that addressed the subject specifically in rats, and only related to peritoneal suture or nonsuture.

There are authors that suggest that peritoneal suture

might increase the formation of adhesions[10,11]. In a study involving Wistar rats, laparotomies and friction of organs with dry gauze were performed, resulting in a significantly larger number of adhesions in the sutured peritoneum group[3].

Another work comparing peritoneum-aponeurotic suture and nonsuture in rats has evidenced the presence of adhesion in both groups, without a significant difference[1]. The standardization of an experimental model in adhesion formation was also researched in rats, which were found in large numbers when the peritoneal wound was sutured[8].

Literature presents similar essays performed in other kinds of animals, like rabbits and dogs, showing conflicting results in relation to the formation of adherences, according to the species studied[12,13,14].

In humans, the works presented focus only the results obtained by not closing the peritoneum in caesarean sections or gynecological surgeries, without stating any data for comparison.

The experimental studies analyzed did not present any appropriate models in order to establish a relation between the data obtained and the observations in humans, which are performed in caesarean sections, a situation that was not taken into consideration in experimental studies.

As for the peritoneal suture or nonsuture when closing the abdominal cavity in gynecological surgeries, results indicated in literature show that there might be a reduction of around six minutes in time, saving in suture wires and other doubtful data, such as the decrease in pain and post-surgical hospital stay.

Cochrane Library conclusions[15], indicate and suggest that "...more researches must be performed on the long-term benefits or complications, related to the non-closure of the peritoneum in caesarian sections, and new reviews are expected to be published, as well as more studies should be evaluated".

## Conclusion

There was no significant difference in relation to the formation of adhesions when comparing peritoneal suture and nonsuture in rats, as well as in relation to the rats gender.

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