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Comparative clinical study of port –closure techniques Following laparoscopic cholecystectomy

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Abstract
Introduction*: when the trocar port is greater than or equal to 10 mm, the methods of parietal closure are problematic because the occurrence of incisional hernia is possible.*
Aim*: to demonstrate the effectiveness of the parietal closure of the trocar orifice using a technical device in order to prevent the occurrence of the incisional hernia.*
Materials and methods*: our study is prospective and randomized, carried out over a period of 3 years, concerning 50 cholecystectomy. Twenty-five patients, aged 39 on average, had a wall closure without prevention (P2 group) and 25 others, an average age of 43 years, had a wall closure with prevention (P1 group). The latter consists in using an endoclose type needle allowing complete closure of the entire wall by a U-shaped point under laparoscopic control, the site of this closure has interested the orifice of the trocar (10 mm) located at the level of the left hypochondrium and through which we proceeded to extract the gallbladder. Our study involved 2 homogeneous groups, with regard to age, weight attested by the BMI, abdominal hyperpressure factors, and parietal resistance. During the early postoperative period (until the 30th postoperative day) and late, the infection and the incisional hernia were assessed.*
Results and analysis*: Two patients in the P1 group had a parietal infection versus an infection in the P2 group and we did not observe any incisional hernia in the P1 group whereas it concerned 3 patients in the P2 group (12%).*
Conclusion: *The prevention of disruption on the trocar orifice is essentially based on the choice of the closure process, and in view of the results obtained; our technical device seems quite attractive, however the final results are still being evaluated.*
Key words: Hernia , Trocar port, Closure technique.

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I. Introduction

The advent of laparoscopy has completely changed the therapeutic arsenal in abdominal surgery; this approach is reputed to become a gold standard for various pathologies but the advent of hernias on the trocar port has raised many questions about their genesis and their prevention; Out of 110 publications dealing with laparoscopy reviewed by Leibel et al [1] only five mention the occurrence of hernias. Some authors have evaluated the incidence of hernias[2]; Leibel et al. [1] noted an incidence between 0.8 and 1.2% and most of these studies are retrospective.

II. Objective

The aim of this study is to demonstrate the feasibility, the reproducibility, the simplicity and the efficiency of a closure with prevention based on means and a method of closure that we will describe.

III. Materials and Methods

The study is prospective, randomized and comparative, covering the period from January 2013 to January 2016 (36 months). It totals 50 patients operated for gallblader lithiasis divided into two groups: the P2 group concerned 25 patients who had a closure without prevention and the P1 group concerned 25 patients who had a closure with prevention. We included patients aged 18 and over. The patients (100% female) were cholecystectomized for gallblader lithiasis.

➢**Age and gender**
This series includes a total of 50 women (100%), the average age in the P1 group is 39 years and 43 years in the P2 group.
➢**Multiparity**
It concerns 17 women (68%) in the P1 group and 20 women (80%) in the P2 group with a non-significant difference.
➢**Diabetes**
One diabetic (4%) was collected in the P1 group and 2 diabetics in the P2 group.
➢**BMI**
The majority of patients have a BMI between 22 and 25; it concerns 16 patients (64%) in the P1 group and 18 patients (72%) in the P2 group (Table I).

Table I*:* BREAKDOWN OF BMI IN THE TWO GROUPS

Group	P1	P2	*P*
< 22	0	2 (8 %)	NSD
[22-25]	16 (64%)	18 (72%)	NSD
[26-30]	8 (32%)	5 (20%)	NSD
>30	1 (4%)	0	NSD

NSD**:** No significant difference.
P1 : prevention P 2:without prévention

❑**TECHNIQUE**
➢**Description of the closure technique**

Trocar port diameter (10 mm) (**photo1**)

We proceeded to extract the gallbladder with enlargement at the level of the left

hypochondrium. We generally used 4 trocars.

In groupP1: Our closure process was performed under laparoscopic control; we used a

Endoclose® type needle (or Reverdin type needle) with which we practiced a U-shaped suture

Using slow-absorbing thread (1/0). This U-shaped point took all of the musculo-aponeurotic planes.

On the other hand,**in the P2group,** the means used are usual, as well as the type of suture (point in x or total point).

Photo1. Incision in the left hypochondrium

Photo2: fascial approach

Photo3 : needle: Endoclose.

Photo 4 : suture (endoclose)

Photo 5: the U-shaped **point**.

Photo 6: introduction of the trocar at the center of the U-shaped

Photo 7: after removal of the gallbladder, fascial closure

Photo 8: skin closure.

IV. Results

➢Post-operative data

It should be noted other new risk factors such as abdominal hyperpressure due to coughing,

vomiting, an ileus, etc ...) as well as parietal complications of hematoma or parietal infection and hernia).

There was one case of cough (4%) in the P1 group. In-group P2 in two patients (8%) one presented with a cough and the other with constipation; the difference in the two groups is not significant.

➢Early wall complications

They were noted in two patients (8%) in-group P1 and in one patient (4%) in-groupP2 (Table II).

In the medium term, a hernia was not observed in the P1 group, unlike theP2 group where a hernia was discovered in 3 patients (12%) (Table II).

TableII : **PARIETAL COMPLICATIONS IN THE TWO GROUPS**

Group	**P 1**	**P 2**	***P***
Hématoma	1 (4 %)	0	DNS
pariétal infection	1 (4 %)	1 (4 %)	DNS
Hernia	0	3 (12%)	DS

NSD**:** no significant difference. SD: significant différence
P1 :prévention P2:sans prévention

TableIII*:* CHARACTERISTICS OF P2 GROUP PATIENTS WITH AN INCISIONAL HERNIA.

Age (P2)	Multiparity	BMI	Diabete	parietal infection	abdominal hyper pressure	The delay in the appearance
26 years	+	23 -	+	-		6months
47 years +	28 -		-	-		6months
74 years	+21	-	-	-		11 months

P2 : without prevention.

V. Discussion

➢Diameter and type of trocar

The risk of eventual disruption of the trocar port is certainly linked to the diameter of the latter [3-4]; Trocars are mainly involved with a diameter of> or equal to 10 mm [5-8]; moreover, Kadar et al [4] had demonstrated it: for 10 mm the risk was 0.23%, it increased to 3.1% for the 12 mm trocars; moreover, the widening of the orifice during the extraction of the operative part led to the occurrence of the hernia, this appears in 57% of the cases in the series of Boike [8].

➢About the choice of the trocar

Leibel et al [1] showed a significant decrease from 1.83% to 0.17% in the occurrence of hernia using a conical trocar rather than a cutting trocar. R. Bittner has moreover proved the danger of these sharp trocars.

➢The site of the trocar orifice

Kadar et al [4] described extra-umbilical incisional hernia whereas Montz et al [2] evaluated 75% of incisional hernia at the umbilical level and 25% at the extra-umbilical level; on the other hand Boike et al have reported a quasi-inverse distribution [8] and in the entire literature, umbilical incisional hernia represent 31% of the published cases.

➢The delay in the appearance of incisional hernia

The onset is generally late; several months to several years [9-10-11-4-12-13]; On the other hand for Boike et al the average delay was 8.5 days [8].

Clinical manifestations are marked by localized pain, a parietal mass, or an occlusive picture; often asymptomatic found in the series of Montz et al [2] where an incidence of 24.7% is noted and whose discovery is fortuitous during a systematic clinical examination.

➢Prevention

Risk factors [14] which predispose to the onset of incisional hernias are known as diabetes, renal failure, obesity, postpartum, chronic bronchitis, ascites, constipation, smoking, undernutrition, treatments that delay wound healing (corticosteroid therapy, chemotherapy), and wall infection.

In addition, various closure procedures and techniques have been recommended to prevent the occurrence of incisional hernia; Inevitably closing the trocar port appears to be the essential element of this prevention; only one study was able to demonstrate the significance of this gesture significantly [4] for a 12 mm trocar; Plaus [12] proposed in the same perspective the preventive closure of any orifice> 5mm and Montz et al [2] for orifices> 8mm.

But all were unanimous and admitted for a diameter> or equal to 10 mm [5, 10, 7, 15].

Also the approximate suturing of the anterior fascial sheet does not seem sufficiently effective in many cases [17] and in nearly 18% of incisional hernia in the series of Montz et al [2]; Lajer et al [16] rated it 23% and Azurin et al [14] rated it 100%! So it seems that a parietal solidity is obtained during a total closure of the aponeurotic planes under laparoscopic control using all kinds of specific instruments or not [17]; only one randomized study evaluated these closing techniques: that of Elashry et al [17] who used the technique of Carter Thomasson [19], it allows a wide grip of the edges of the orifice using a specific device. The results of this closure involved 95 12-mm trocar ports without any disruption, which seems interesting, but the study by Elashry [18] included only 32 patients.

Other techniques have been described such as that of Keskin et al [20] which uses simple and non-specific means but no randomized study has been able to demonstrate its long-term effectiveness.

Our study made reference to several data; first in relation to the factors favoring the occurrence of incisional hernia; such as obesity which increases the difficulty for the total closure of the fascial banks through a small orifice (difficult and insufficient closure), as well as multiparity, diabetes and abdominal hyperpressure factors (chronic cough, constipation, etc.) intraoperative risk factors (site and diameter of the trocar orifice) and postoperative factors such as parietal infection, which provides short and long-term dehiscence. And at the

present time, we did not note any incisional hernia in the patients who benefited from a preventive closure contrary to the P2 group (without prevention) with three patients who developed a incisional hernia and in whom we identified factors of risk like multiparity, cough and obesity.

VI. Conclusion

Currently the use of larger and more numerous trocars has become a necessity given the complexity of the interventions. The actual incidence of incisional hernia remains unknown as there are few randomized studies; nevertheless it is a complication which can become serious. The choice of a technique which must be simple, rapid and reproducible, making it possible to obtain a solid parietal repair must avoid the patient having to re-operate. Our study has demonstrated the effectiveness of our technical device which seems attractive in view of the first results which are satisfactory, but these are medium-term results and the effectiveness of the method remains to be proven by a study on the long term.

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