

Efficacy of the Small-Bites closure Technique in Reducing the Incidence of Incisional Hernia in the Overweight/Obese Patient. Randomized Clinical Trial

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Abstract

Introduction: Incisional hernias are a common complication arising after midline laparotomy closure, and represent a significant burden of morbidity and deterioration in patients' quality of life. Their incidence after laparotomy ranges from 2% to 20%, while that of abdominal dehiscence is between 1% and 3%. In patients considered to be at high risk, such as those who are overweight/obese, this complication can reach a worrying 35%. This makes it essential to seek strategies to prevent this type of complication. The aim of this study was to determine the efficacy of the small-bite closure technique in reducing the incidence of incisional hernia in obese patients. **Methods:** A prospective cohort study was performed, where 40 patients older than 18 years with BMI ≥ 25 who underwent elective or emergency laparotomy with midline incision and small-bites closure technique were included, who were followed up ultrasonographically for one year, to detect the presence or absence of incisional hernia. The sample size was calculated with a 95% confidence level, a power of 80% and an expected frequency of 35% of incisional hernia development.

Results: After a follow-up of 12 months we concluded with a total of 38 patients, with an age between 43 and 62 years, the most frequent sex was female. The most frequent reason for surgery was exploratory laparotomy (52.6%). Regarding nutritional status, 63% of the individuals were diagnosed as overweight and the remaining 37% as obese. The incidence of incisional hernia was 4 cases (10.5%) in 38 patients in a 12 months period.

Conclusions: The use of the small-bite technique in midline surgery is effective in reducing the incidence of IH in overweight and obese patients, with zero frequency of surgical site infections, hematomas or dehiscence and a minimal percentage in the presence of seroma.

Keywords: Hernia • Incisional • Obesity • Abdominal surgery • Abdominal wall

Introduction

Any intervention in the abdominal cavity begins with an incision in the abdominal wall to allow access to the abdominal cavity, and concludes with its subsequent closure. The median laparotomy is the most commonly used incision, as it can be performed efficiently and causes minimal damage to the muscles, nerves and blood vessels present in the area [1]. Poor closure of the abdominal wall either due to improper technique, fatigue after surgery or the

use of inappropriate materials increases the incidence of eventrations. Scientific evidence supports abdominal wall closure using the "small-bites" technique which involves multiple stitches and the use of slow resorbing material [2]. Besides the occurrence of Incisional Hernia (IH), two other common short-term complications related to abdominal wall closure are Surgical Site Infections (SSIs) and fascial dehiscence. Both of these entities have been shown to pose a higher risk of subsequent occurrence of IH and their frequency is higher in obese individuals [3]. The incidence of IH after laparotomy ranges from 9% to 22%, although it has been reported that these figures may underestimate the true incidence, which could be as high as 35% in high-risk patients [4]. Although elective primary closure of a midline incision is usually performed with a "mass closure" or layered technique with simple continuous suture, a suture length to wound length ratio of 4:1 or more (a lower ratio is associated with an increased incidence of incisional hernia) and using non-absorbable or slow absorbing monofilament suture, this problem has not been satisfactorily resolved, including closure in emergency laparotomies. The objective of this study was to determine the efficacy of the small-bite closure technique in reducing the incidence of incisional hernia in obese patients.

Literature Review

Methods

This study was carried out in accordance with the WHO ethical code (Declaration of Helsinki) on human experimentation, was analyzed and approved by the ethics and research committee of the Hospital "Dr. Valentín Gómez Farías" of the ISSSTE with registration number ISSTE/CEI/415/2020, and has the informed consent duly signed by each of the participants in the study.

The design of this study corresponds to an observational, prospective, longitudinal, uncontrolled, observational cohort. The sample size was calculated with a confidence level of 95%, a power of 80%, a background of 35% expected for the appearance of IH, applying the formula for cohort studies of Velazco *et al*, which gives us a minimum of 35 individuals to be followed. Men and women over 18 years of age, with a BMI ≥ 25 kg/m², undergoing laparotomy (elective or emergency), with a midline incision ≥ 5 cm and independent of the baseline diagnosis were included [3-5]. Patients with previous surgery through a midline incision within the past 3 months, systemic immunosuppression, malignancy or pregnancy were excluded. Subjects who did not attend postoperative clinical controls were eliminated [6].

Surgical technique

The aponeurosis closure was performed using 1-0 polypropylene non-absorbable monofilament suture material (Prolene, Ethicon). Throughout all surgical procedures, the umbilicus was dissected from the linea alba to ensure proper closure of the abdominal wall. The linea alba was precisely incised medially and cleared of subcutaneous fatty tissue for a maximum distance of 2 cm in all directions. After the aponeurosis closure, the umbilicus was repositioned using an absorbable suture with an interrupted technique.

For the "Small-Bites" technique: A number 1 polypropylene suture was utilized, initiating with a self-blocking knot at one end of the incision. A continuous suture was then placed, with each stitch spaced 0.5 cm apart and

positioned between 0.5 mm to 0.8 mm from the aponeurotic edge. The suture was concluded with a square or Aberdeen knot. No drains were retained following the completion of closure for the subcutaneous fatty tissue and skin in the conventional manner.

Statistical analysis

All data were analyzed using SPSS version 26 in Spanish. Quantitative variables were assessed for normality and presented using appropriate measures of central tendency and dispersion. Qualitative variables were expressed as frequencies. The chi-square test was used to determine differences between percentages.

Results

The cohort initially comprised 40 subjects, with 2 individuals being excluded due to non-compliance with follow-up visits (Figure 1). The age of the population ranged from 43 years to 62 years, with a median age of 52 years. Females represented the majority, accounting for 52.6% of the cohort. Exploratory Laparotomy (LAPE) was the primary indication for surgery in 52.3% of cases, followed by acute abdomen (31.6%) and colostomy (15.8%) (Table 1). Concerning BMI, 24 subjects (63.2%) were diagnosed with overweight, 12 (31.6%) with obesity class I, and II (5.3%) with obesity class II (Figure 2).

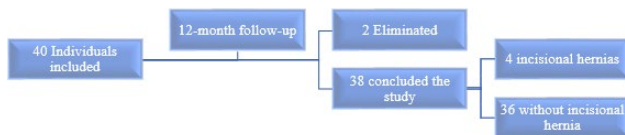


Figure 1. General outline of the study

Table 1. General characteristics of the population

N=38		
	Median	q25-q75
Age (years)	52	(43-62)
Sex	n	%
Female	20	52.60%
Male	18	47.30%
Diagnosis		
Acute Abdomen	12	31.60%
Laparotomy	20	52.60%
Colostomy	6	15.80%
Fuente: expediente clínico		

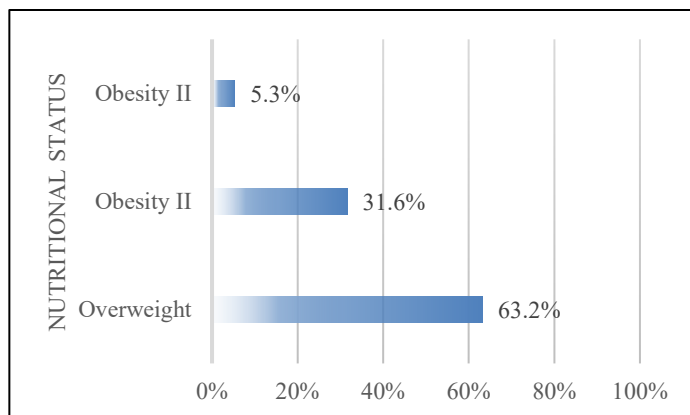


Figure 2. Classification of the population according to their IMC

Post-surgical complications were minimal, with no reports of infections, wound dehiscence, or hematomas. 6 cases of seroma (15.8%) were documented, none of which progressed to incisional hernia by the end of the evaluation period. The incidence of incisional hernia within the 12-months follow-up period was 4 cases among the remaining 38 individuals, corresponding to a rate of 10.5% (Figure 3).

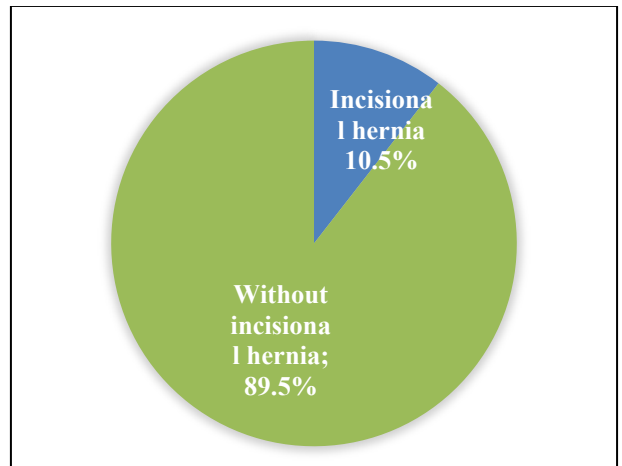


Figure 3. Incidence of incisional hernia following midline abdominal surgery with small-bite technique

Additionally, a table was included to compare the frequency of risk factors between subjects who developed incisional hernia and those who did not (Table 2). The only factor showing a trend towards statistical significance was the closure time (greater than 20 minutes), while other analyzed factors did not demonstrate statistically significant differences. Notably, all individuals who developed incisional hernia had a BMI falling within the range of 25 to 29.9.

Table 2. Frequency of risk factors in patients undergoing abdominal mid-line surgery with small-bites technique

N= 38			
	Incisional Hernia (n=4)	Without Incisional Hernia (n=34)	p
Previous Surgery	2 (50%)	20 (58%)	0.735
Wound Length (>10 cm)	4 (100%)	28 (82.3%)	0.36
Surgery Time (>120 mins)	4 (100%)	22 (64.7%)	0.151
Closing Time			
10 a 15 mins	2 (50%)	14 (41.1%)	0.072
16 a 20 mins	0	16 (47%)	
> 20 mins	2 (50%)	4 (11.7%)	
Seroma	0	6 (17.6%)	0.36
BMI > 29.9	4 (100%)	20 (58%)	0.106
* La diferencia entre porcentajes se calculó con la prueba de Chi cuadrada			

Discussion

The results obtained in this study support the use of the Small-Beat technique in midline surgery to reduce the incidence of IH in overweight and obese patients, with a null frequency of surgical site infections, hematomas or dehiscence and a minimum percentage in the presence of seroma. We can argue such a decrease by comparing our results with incidence rates reported by other authors in obese population such as Kaminski, who found an incidence of IH of 33% in patients weighing more than 113 kg compared to 5% in patients weighing less than 200 lb [7].

Hoyle *et al.* have identified incidences of 10% of IH in overweight/obese patients, contrasting with other authors, such as Itatsu *et al.* who have found an increase of this complication up to 2.81-fold (95% CI 1.42-5.52) in those subjects with a BMI greater than 30 kg/m² and 1.76-fold (95% CI 1.35-2.3) in individuals with a BMI between 25 and 29.9 kg/m² [4].

In a study titled "Small Bites versus Large Bites for Closure of Abdominal Midline Incisions (STITCH)," published in 2015, a prospective, multicenter, double-blind investigation was conducted. This study enrolled patients over 18 years old who underwent elective laparotomies in general surgery and gynecology services, with a total of 545 participants. The findings revealed that the small-bites closure technique proved more effective than the traditional large-bites technique in preventing incisional hernias, without increasing the risk of adverse events. Consequently, it was concluded that the small suture technique could potentially become the standard approach for closing abdominal wall incisions in cases of midline laparotomies [8,9].

Consistent with our findings, the aforementioned study reported a 15.8% incidence of seroma and a 10.5% incidence of hernia at the one-year follow-up as post-surgical complications. Another randomized, controlled study conducted in 2011, investigating the impact of the small bites technique on midline incisions, also referred to as "Small Stitches," enrolled a total of 576 patients. Apart from assessing the incidence of incisional hernia, postoperative complications were analyzed as secondary outcomes. The results of this study provided level 1b evidence supporting the use of continuous suturing with the small bites technique, highlighting its advantages over the traditional large bites technique [10].

Both studies demonstrated the superiority of the small bites technique compared to the traditional large bites technique. However, no mention was made of the difference in the incidence of these complications in patients with obesity when using the technique, nor were adverse events that may occur after laparotomy included.

Conclusion

Based on the findings of this study, it is evident that the utilization of the Small-Bites technique in midline surgery proves effective in reducing the incidence of Incisional Hernias (IH) among overweight and obese patients. Notably, this technique is associated with a complete absence of surgical site infections, hematomas, or dehiscence, and a minimal occurrence of seroma.

This holds significant clinical importance as overweight or obese patients are inherently at a heightened risk of developing postoperative complications, including incisional hernias. The implementation of the Small-Bites technique serves to mitigate this risk by offering a more robust and secure suture, particularly beneficial in patients with elevated abdominal wall tension.

The absence of surgical site infections linked to the Small-Bites technique is particularly noteworthy. Surgical wound infections are a prevalent

complication that can impede healing and elevate the likelihood of incisional hernias. Moreover, this technique has demonstrated a reduced incidence of hematoma and wound dehiscence, both of which can compromise the integrity of the incision and heighten the risk of incisional hernias.

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