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Comparative Study between Laparoscopic and Non-Laparoscopic Surgeries on Blood Sugar Levels Intraoperative

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Abstract

Main object: This study aimed to assess the impact of laparoscopic and non-laparoscopic procedures on the blood glucose levels of patients at Baghdad Hospital and Al-imam ALI Hospital in Baghdad, Iraq.

Methodology: The study was conducted from 16 November 2023 to 2 March 2024. A total of 50 patients, aged between 15 and 58 years, were included in this study. There were 25 males and 25 females, all with an American Society of Anesthesiologists (ASA) physical status of either I or II. The patients were divided into two groups based on the type of operation they underwent, with each group consisting of 25 patients. One group underwent laparoscopic surgery, while the other group underwent non-laparoscopic surgeries. The data obtained for all patients include their age, gender, weight, kind of operation, and measurements of blood sugar levels before, during, and after the operation.

Results: There was no statistically significant difference between the two groups in terms of gender and age groups (P. Value > 0.05). In all surgical groups, 11 males (22%) and 14 females (28%) received surgery. Among these patients, 13 (26%) were between the ages of 32 and 42 and underwent non-laparoscopic surgery. Additionally, 9 patients (18%) in the age ranges of 21–31 and 32–42 underwent laparoscopic surgery. The blood glucose levels of patients who underwent laparoscopic surgery were significantly higher before, during, and after the operation compared to those who had non-laparoscopic surgery. Specifically, the levels were (96.2), (138.6), and (168.6) before, during, and after the operation respectively, while the levels for non-laparoscopic surgery were (76.9), (82.8), and (88). The difference in blood glucose levels during the operation was statistically significant with a P value of (<0.05), and the difference before and after surgery was highly significant with a P value of (<0.01).

Conclusion: Laparoscopic surgery results in higher blood sugar levels in patients compared to nonlaparoscopic surgery.

Keywords: Anesthesia, Blood sugar, Laparoscopy, Non-laparoscopic surgery

1. Background

The procedure derives its name from the laparoscope, a slim instrument equipped with a miniature video camera and light at its tip. When a surgeon inserts it through a small incision into a patient's body, they are able to observe the internal proceedings of the patient by viewing a video monitor. Devoid of those instruments, they would be compelled to create a significantly larger aperture. With the use of specialized devices, the surgeon can avoid the need to physically reach into the patient's body. This also implies a reduction in the act of cutting. Prior to the implementation of this technique, a surgeon performing a procedure on a patient's abdomen had to create an incision that measured between 6 and 12 inches in length. This provided them with sufficient space to clearly see their tasks and access any areas they needed to work on. There exist two distinct categories of laparoscope: (Romy *et al.*, 2008; Finlay & Ornstein, 1995). A telescopic rod lens system, typically linked to a video camera (either single chip or three-chip). A digital laparoscope is equipped with a miniature digital video

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camera at the end, removing the need for a rod lens system. Laparoscopic surgery refers to a surgical procedure that is performed with a laparoscope, which is a thin, flexible tube with a camera and light source attached to it. This minimally invasive technique allows surgeons to view (Somogyi, 1945; Soper *et al.*, 1994).

Laparoscopic surgery, or minimally invasive surgery, is a surgical procedure in which small incisions are made in the body to access and operate on internal organs or tissues using specialized instruments and a camera. Laparoscopic surgery offers advantages such as reduced incision size, decreased pain, and a quicker recovery period in comparison to conventional open surgery. Some examples of laparoscopic surgery are cholecystectomy (gallbladder removal), appendectomy (removal of the appendix), and hernia repair "(Vecchio *et al.*, 2000; Ballantyne, 2002)."

Open surgery: Non-laparoscopic surgery encompasses any surgical procedures that do not involve the use of laparoscopic or minimally invasive techniques. This category includes both standard open surgery and endoscopic surgery. Non laparoscopic surgery encompasses procedures such as open-heart surgery, joint replacement surgery, caesarean section, gallbladder removal surgery, and thyroidectomy (Hasson, 1999; Taylor *et al.*, 1995). Blood sugar, or blood glucose, is the measure of glucose (a kind of sugar) in the blood. Glucose serves as the primary fuel for the body's cells and is controlled by a hormone known as insulin, which is synthesized by the pancreas. The typical range of blood glucose levels in persons who have undergone a minimum 8-hour fast is 70–99 mg/dL (3.9–5.5 mmol/L) (Roth *et al.*, 2007; Cho *et al.*, 2017). The objective is to evaluate the impact of laparoscopic and non-laparoscopic procedures on blood glucose levels.

2. Experimental method

This study is a prospective study that took place in Baghdad Hospital and Al-IMAM ALI Hospital in Baghdad, Iraq, from November 16, 2023, to March 2, 2024. The study was done under the supervision of the Department of Anaesthesia at Sousa university, faculty of medicine, (Ibn-eljazzar) A total of fifty (50) patients, ranging in age from 15 to 58 years, were included in this study. The group consisted of twenty-five (25) males and twenty-five (25) females, all with American Society of Anesthesiologists (ASA) physical status of either I or II. The patients were divided into two groups based on the type of surgery they underwent, specifically L and N.L surgeries. Each group consisted of 25 patients. Patients with diabetes will be excluded.

Each patient's data and information are collected individually in a standardised manner. This includes the patient's name, age, gender, weight, type of procedure, and measurements of blood sugar levels before, during, and after the operation for both laparoscopic and non-laparoscopic surgeries. The blood glucose concentration was measured at three time points: 5 minutes before induction (T1), 5 minutes after induction (T2), and 5 minutes after completion of the operation (T3) during the recovery period. The statistical analysis was conducted using SPSS version 26.

Every morning, before starting any procedure, the normal anaesthetic machine check was performed in the operating room. A noninvasive blood pressure cuff, ECG, and pulse oximetry probe were subsequently connected to the patient. Initial measurements of blood pressure, heart rate, respiratory rate, and peripheral oxygen saturation were collected and continuously monitored during the entire surgical procedures. The procedure of venous access was carried out using an intravenous cannula of either 18, 20, or 22 gauge. Following this, intravenous normal saline was started. Prior to this, the patient was administered oxygen through a face mask for a duration of 3 minutes. Anaesthesia was then induced using propofol at a dose of 2.5 mg/kg and rocuronium at a dose of 0.6 mg/kg to aid in tracheal intubation. Additionally, ketamine was administered at a dose of 0.5 mg/kg. At the conclusion of the surgical procedure, the administration of anaesthesia was stopped, and the reversal of the neuromuscular blockade was performed by intravenously administering 2.5 mg of neostigmine and 1 mg of atropine. The removal of the breathing tube from the trachea was carried out when the patient was able to breathe on their own with a sufficient amount of air, completely conscious, and capable of holding their head up for more than 5 seconds.

Both groups received 500 ml of crystalloids intravenously, specifically 0.9% normal saline. During the operation, blood sugar levels were regularly monitored.

3. Results

The Table 1 summarises the results of the analysis in a methodical manner. A coherent analysis was presented to demonstrate the noteworthy discovery.

Table 1 displays the distributions of cases based on their age groups and the type of operation they underwent. Patients aged between 21 and 31 underwent laparoscopic and non-laparoscopic surgery with equal frequency, accounting for 18% of the total. Among patients aged between 32 and 42, 26% underwent non-laparoscopic surgery, which was more

Table 1. Presents the distribution of study patients categorised by age groups.

			Type of surgery		
			L	L.N	Total
Age groups	21–31 years	No.	9	9	18
		%	18%	18%	36%
	32–42 years	No.	9	13	22
		%	18%	26%	44%
	43–53 years	No.	6	3	9
		%	12%	6%	18%
	54–63 years	No.	1	0	1
		%	2%	0%	2%
Total		No.	25	25	50
		%	50%	50%	100%
P. value > 0.05, NS					

Table 2. Distribution of patients according to their gender and type of surgery.

			Type of surgery		
			L	L.N	Total
Gender	Male	No.	11	11	22
		%	22%	22%	44%
	Female	No.	14	14	28
		%	28%	28%	56%
Total		No.	25	25	50
		%	50%	50%	100%
P. value > 0.05, NS					

common than laparoscopic surgery (18%). However, among patients aged between 43 and 53, laparoscopic surgery was more frequent (12%) compared to non-laparoscopic surgery (6%). Similarly, among patients aged between 54 and 63, laparoscopic surgery was more common (2%) than non-laparoscopic surgery (0%). Statistically, the observed difference did not reach a level of significance (P-value > 0.05).

Table 2 show distribution of patients by gender and type of surgery. Although total were similar to patients distribution in non laparoscopic surgery 21–31 years 32–42 years 43–53 years 54–63 years Laparoscopic surgery non-laparoscopic surgery group 11(22%) males and 14(28%) females. There was non-significant difference between both groups (P. value > 0.05).

Table 3 displays the average, standard deviation, lowest value, and highest value of blood sugar levels among the patients involved in this study at various stages (preoperative, intraoperative, and postoperative). The average blood sugar levels during the pre, intra, and postoperative periods of laparoscopic surgery were 96.2, 138.6, and 168.6, respectively, which were higher than the corresponding levels of non-laparoscopic surgery, which were 76.9, 82.8, and 88. The statistical analysis revealed substantial differences during the intraoperative time (P-value 0.05) and highly significant differences (P-value 0.01) during the pre and postoperative periods.

4. Discussion

This study was done to examine the impact of laparoscopic and nonlaparoscopic procedures on blood glucose levels. We monitor blood sugar levels before, during, and after various stages of the surgery. There is no significant difference (P-value > 0.05) between age groups and gender in relation to the type of operation, as indicated by Tables 1 and 2. The cause may be attributed to the limited sample size utilised in this investigation, which resulted in an underestimation of the significance and influence of gender disparities. Laparoscopic procedures provide several advantages, including lower blood loss, decreased trauma, faster recovery time, shorter hospital stays,

Table 3. Comparison between the effect of laparoscopic and non-laparoscopic surgery on blood sugar level during different periods.

periods	Type of surgery								Sig.
	Laparoscopic surgery				Non-laparoscopic surgery				
	Mean (mg/dl)	SD	MINI	MAX.	Mean mg/dl	SD	Mini.	Max.	
preoperative	92.2	12.2	80	123	76.9	7.7	48	86	P < 0.01 HS
Intraoperative	138.6	46.2	59	212	82.8	5.9	63	91	P ≤ 0.05 S
postoperative	168.6	27.4	117	213	88	3.5	83	95	P < 0.01 HS

and utilisation of new technology. Therefore, numerous geriatric patients opt for laparoscopic procedures due to its ability to minimise blood loss, trauma, discomfort, and problems, while also facilitating a quicker recovery and shorter hospital stay (Mol, 2000; Soskin, 1941). Despite the various benefits of laparoscopy surgery, such as its ability to minimise the psychological and social impact of major surgery and visible scars on young individuals, a significant number of younger patients in the present study still opt for open surgery. There are several possible reasons for this situation. One reason is the high cost of this operation, combined with the limited sources of income and high unemployment rates, particularly among young people in Iraq. Another reason could be the lack of medical awareness about this type of operation within society. Furthermore, numerous adolescent patients exhibit apprehension against undergoing this particular procedure, either due to their inability to access a specialised physician or their lack of trust in the hospital's proficiency and capacities in this domain (Soskin, 1944; Gloyn *et al.*, 2004).

Table 3 displays the blood sugar levels of patients at various stages of laparoscopic surgery, namely preoperative, intraoperative, and postoperative. It is evident from the table that there was a considerable increase in blood sugar values during the procedure. The surgical procedure exerts physiological strain on the body, which can lead to increased blood glucose levels. Additionally, there may be alterations in lifestyle, dietary habits, and physical activity both prior to and following the operation, which can significantly impact glucose levels. Although the precise cause for this phenomenon cannot usually be ascertained. Stimulation of the sympathetic nervous system typically results in an elevation in the release of anti-insulin hormones and an increase in blood sugar levels (Bays *et al.*, 2005; Davis & Lastra-Gonzalez, 2008). These findings contradicted the conclusions of (Kanno *et al.*, 2009), who discovered that laparoscopic surgery prevents an increase in blood glucose levels and enhances insulin resistance in comparison to open surgery. The laparoscopic group had decreased blood glucose levels compared to the open group on the day of the surgery and over the days following the operation (Mostafa *et al.*, 2018; Ziogas & Tsoulfas, 2017). A 2018 study published in the Journal of Endourology examined patients who had undergone kidney surgery. Preoperative and postoperative blood sugar levels were assessed, revealing that laparoscopic surgery resulted in a lower postoperative blood sugar increase compared to standard surgery (Duggan *et al.*, 2018; Kanno *et al.*, 2009).

5. Conclusions

The content of glucose in the blood is higher in Laparoscopic surgery compared to nonlaparoscopic surgery. Blood glucose levels exhibited an elevation during the preoperative, intraoperative, and postoperative phases of laparoscopic surgery.

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