Length of Laparotomy for Suspected Acute Appendicitis in Relation to Body Mass Index

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Abstract:

Background: Acute appendicitis is one the most common clinical presentations that requires urgent surgery, with a lifetime incidence of about (8%), the right lower quadrant incision of open appendecectomy has persisted essentially unchanged since it was pioneered by McBurny in the 9th century.

Aim: To evaluate the effect of trunkal obesity and BMI on the length of the incision of appendecectomy.

Patients and Methods: A prospective analysis including 199 patients who suspected to have acute appendicitis (A.A), during time period of 9 months (from first of July 2012 to first of April 2013) who were arrived at casualty department of Azadi Teaching Hospital in Kirkuk city, Iraq. After dicision of surgical intervention; each patient was interviewed by senior house officer to complete a questionnaire which was including demographic data: age, gender and clinical data including weight in (kg) height in (meter), (BMI) (classification of WHO) as shown in table (2), history of previous operation or previous attack of the pain, abdominal girth in supine and standing positionwhich is normal for female and male is between 88 and 94 cm respectively and abdominal torso or abdominal height (distance between xiphoid and symphysis pubis) were measured (normal range 30-45cm for obese and 14-27cm for thin patient).

Results: Majority (63%) of the patient were in 2nd and 3rd decade of age with mean age was 29 year, ranging from 10-70 years, on gender aspect, majority were females (58.8%), with female to male ration of 1.4:1. About half of the patient were underweight or normal weight while one third of the patient were overweight, and remaining were obese with one patient (0.5%) was morbidly obese, the length of the incisions length were from (3-11cm) with mean length of incision was 5.9cm.

Conclusions: BMI is significantly related to the length of appendectomy incision, the overweight or obese one needs alonger incision in comparison to normal range or underweight patients.

Keyword: Acute appendicitis, length of wound, BMI, Obesity.

Introduction:

Acute appendicitis is one of the most common clinical presentations that requires urgent surgery, with a lifetime incidence of about (8%) [1,2], the disease was first described in 1886 by pathologist named Reginald Fitz who introduced the term appendicitis [3].Open appendectomy has been a well-established and widely performed operation indicated for patients with acute appendicitis (AA) [4]. The first successful surgery is being attributed to a Scottish surgeon and gynecologist Lawson Tait who performed an open appendectomy in 1880. The accuracy of a clinical diagnosis of acute appendicitis based on patients history and physical examination ranges (84%), because

other gastrointestinal and genitourinary tract abnormalities can present in same manner [5].

Acute appendicitis commonly requires urgent surgical intervention [6], Acute appendicitis (A.A) is the most common cause of acute non-traumatic surgical abdomen in Kirkuk province [7] and the most common abdominal operation performed on an emergency basis in Iraq as whole [8].

Few studies exist regarding relation between length of the incision and BMI (Body Mass index equal to body weight in kg/ Height in meter) [4], like a study was performed in Japan that; showed the length of minilaparotomy increased significantly in patients with increasing BMI equal to 25KG/m2, in whom were the thickness of the abdominal wall equal to 2.1cm and the thickness of rectus muscle equal to 1cm [9].

Another study from India done studying open appendectomy claimed; that operation was successfully completed by a small incision in most of the patients with the exceptions of complicated and obese patients that need extension oftheincision [10]. Paper from USA showed that open appendectomy in overweight patients (those with a body mass index or equal to 25) may be more difficult due to excessive subcutaneous adipose tissue. The open incision may be of a considerable length, which may result in increased postoperative (n.12) pain and a long stay at hospital[11,12] as we cut muscles and do more manipulation and stretch. Obese patient is characterized by excessive adipose tissue and thickest abdominal wall [13, 14, 15], this work is a clinical trial to evaluate the effect of trunkal obesity and BMI on the length of the incision of appendecectomy.

Patients And Methods:

Aprospective analysis including 199 patients who suspected to have acute appendicitis (A.A). In a time period of 9 months (1st of July 2012 to 1st of April 2013) who were arrived at Casualty department of Azadi Teaching HospitalIn Kirkuk city_ Iraq. Patients with suspected (A.A) was admitted mostly by senior house officer while on duty or referred from other district where surgical facilities were not available, final decision regarding proper management was made by senior surgeon on call.

The diagnosis for (A.A) in our Emergency Department is mostly clinical depending on Alvarado score (where 6 or more considered having suspected acute appendicitis as shown in Table (1). All the patients were sent for white blood cell count and urine analysis, ultrasound of the abdomen and pregnancy test for married childbearing age women.

After decision of surgical intervention; each patient was interviewed by senior house officer to complete including demographic data age, data including weight in(kg), (height in(meter), (BMI) (classification of WHO) as shown in table (2) history of previous operation or previous attack of the pain, abdominal girth in supine and standing position) which is normal for female and male is between 88 and 94 cm respectively (and abdominal torso or abdominal height (distance between xiphoid and symphysis pubis) were measured (normal range 30_45cm for obese and 14-27cm for thin abdomen). Basic criteria was to include all appendectomies that done by Grid-iron incision, in conventional appendectomy the incision that is widely used for appendectomy is the one called grid-

iron incision(described first by Mc Arthur is made (approximately 5-8cm) at right angle to a line joining the anterior superior iliac supine to the umbilicus, centered on McBumey point) which is a point one third of the distance from the umbilicus to the anterior superior iliac spin) The place and the length of the incision will vary according to the thickness of the abdominal wall and the suspected position of the appendix, except those appendicectomies done by right paramedian or lower midline incision, and acute appendicitis in pregnant. The study approved by ethical committee of Iraqi board for General Surgery. All cases of suspected acute appendicitis were put on nil by mouth (NPO), IV fluid (as sodium chloride (0.45%) w/v and Glucose (2.5%) wlv intravenous infusion according to each patient'srequirement). While decision of the operation was made, informed consent signed by the patient and the surgeon. The patients were screened for viral diseases (HIV, HBs antigen and Hcv), perioperative prophylactic antibiotic given ampiclox 500mg IV. (Ampicillin 250 mg plus Cloxacillin acid 250 mg,all the operations were performed by senior house officer and under direct supervision of the surgeon in charge. During surgery position of the appendix and macroscopical appearance of the appendix (normal inflamed or gangrenous) were documented, at the end of the operation the length of incision measured by using a sterile syringe as shown in figure (1), all the excised appendices were sent for histopathological examination. all operations done with open appendectomy (laparoscopy not used atall).

Postoperatively all patients encouraged for early mobilization and oral intake Analgesia given (infusion 600mg iv paracetamol ;acetamomophine) and the patients were discharged home when they are well and fulfilled discharge criteria

Patients were followed up on weekly basis regarding his or her recovery status and document any surgical complication like (wound infection, seroma, hematoma and features of intestinal obstruction).

The collecting data were analyzed using the IBM SPSS (statistical package for social sciences) statistics version 21.

A T- test analysis was made, P values less than 0.05 were considered positive and statistically important.

Table (1): The Alvarado scoring system.

	Mnemonic (MANTRELS)	Value
Symptoms	Migration of the pain Anorexia Nausea and vomiting	1 1 1
Signs	Tenderness in right lower quadrant Rebound tenderness Elevation of temperature)37.2c	2 1 1
Laboratory	Leukocytosis Shift to the left	2 1
Total score		10

Figure (1): Sterile syringe formeasuring length of the incision.

Table (2): WHO classification of BMI.

Classification	BMI (kg\m)
	Principal cut _off points
Under weight	<18.50
Sever thinness	<16.00
Moderate thinness	16.00_16.99
Mild thinness	17.00_18.49
Normal range	18.50_24.99
Over weight	≥ 25.00
Pre _obese	25.00_29.99
Obese	≥30.00
Obese class I	30.00_34.99
Obese II	35.00_39.99
Obese III	≥40.00

Results:

Majority (63%) of the patient were in 2nd and 3rd decade of age with mean age was 29 year, ranging from 10-70 years. Figure (2) shows the range of the age & gender of the distribution study population.

On gender aspect, majority were females (58.8%), with female to male ration of 1.4:1. About half of the patient was underweight or normal weight while one third of the patient was overweight, and remaining was obese with one patient (0.5%) was morbidly obese, as shown in table (3).

The length of the incision was from (3-11 cm) with mean length of incision was 5.9cm table (4). In underweight and normal weight patients the longer incision used were 3.9cm and 5.9cm respectivel, while 6.9cm was the upper limit of the length of the incision in overweight. In obese patient the length of incision was ranging from 7-11cm

and the length increased with increasing BMI as shown table (4).

While length of incision in patients with sub hepatic position of the appendix was not related to BMI, and all require extension of the incision, whatever BMI was as shown in table (5)

Measurement of abdominal girth (circumference) in standing position was ranging from 50cm to 129cm in different body weight and gender group as shown in table (6). In normal weight we found that 36 female patients had abdominal girth in standing position ranging from (80-89).

Measurement of abdominal girth (circumference) in supine position was ranging from 40cm to 129cm in different body weight and gender groups as shown in table (7).

The measurement of Torso, were ranged from 20 cm to 39 cm with mean of (33.8), the measurement were varies in different weight groups as shown in table (8).

The Torso in normal weight patient was ranged from 30-33 cm and increasing BMI up to 39 cm in obese patient.

Abdominal girth in standing and supine position, torso measured and correlated with BMI and length of the incision in patients underwent laparotomy for suspected acute appendicitis, the relation was significant statisistically specially circumference of the abdomen and length of torso were increased with increased with increased BMI, and the patient were in the need of longer incision for removal of the appendicitis as shown in table (9).

Hospital stay and need of analgesia were significantly related to the BMI of the patients, who need longer incision as shown in table (10 and 11).

Thirty one (15.6%) of the patients need to stay 2 or more days postoperatively in the hospital while 30 patients (96.7%) were overweight or obese or have sub hepatic appendicitis who need longer incision. BMI is also significantly related to the postoperative analgesia as those of normal or underweight (BMI<24.9=83 patients 53.2%) needed Just one dose, while overweight and obese (BMI>25=37 patients 86%) needed 2 or more doses of postoperative analgesia as shown in table (10).

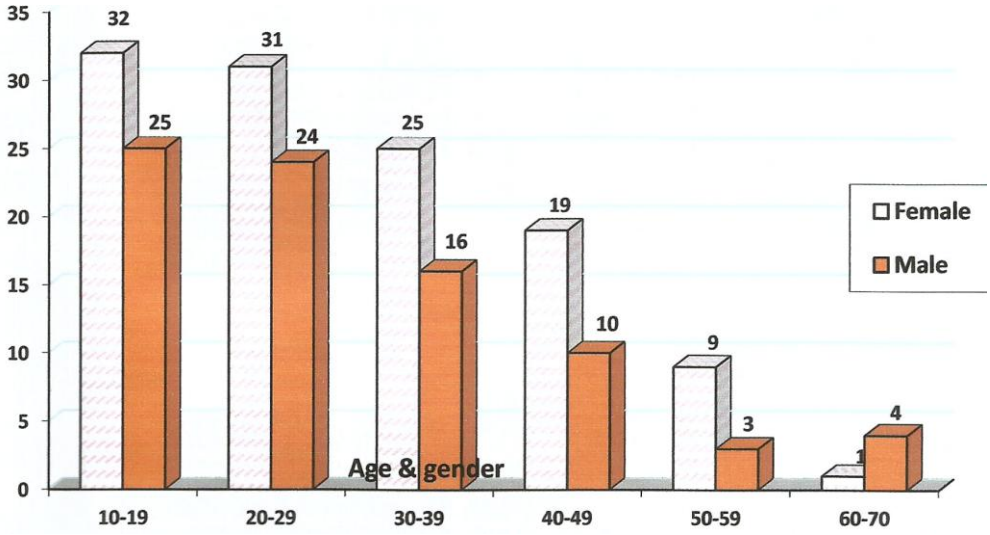

Figure (2): The age and gender distribution of the study population (N. =199)

Table (3): Number and frequency of BMI distribution in correlation to WHO classification of BMI.

BMI kg\ m^2	No. and frequency
13.20-15.90	9 (4.5%)
16.00-16.99	6 (3.0%)
17.00-18.49	12 (6.0%)
18.50-24.99	60 (30%)
25.00-29.99	62 (31.0%)
30.00-34.99	38 (19%)
35.00-39.99	12 (6.0%)
More than 40	1 (0.5%)

Table (4): Number and frequency of length of the incision in different weight groups.

Patients Weight Groups	Length of Wound in cm	No. and Frequency	P value
Underweight †	3.0_3.9	5 (2.5%)	0.00
	4.0_4.9	41 (20.5%)	
Normal range †††	5.0_5.9	43 (21.5%)	
Overweight	6.0_6.9	50 (25.0%)	
Obese	7.0_7.9	35 (17.50%)	
	8.0_8.9	15 (7.5%)	
	9.0_9.9	7 (3.5%)	
	10.0_11.0	3 (1.5%)	

Table 5: Showed relation between length of incision and BMI in subhepatic position of the appendix.

Length of incision	BMI	P valve
7 cm	17.3 21.8 22.3	0.000681
7.5 cm	20.2	

Table (6): Shows number and frequency of patients with different abdominal girth in standing position in different weight and gender groups.

Patients weight groups	Abdominal girth standing cm		No. and frequency
Underweight	50_59	Female 7	16 (8.0%)
		Male 9	
	60_69	Female 10	18 (9.0%)
		Male 8	
	70_79	Female 8	24 (12.0%)
		Male 16	
Normal range	80_89	Female36	53 (26.5%)
		Male 17	
Overweight	90_99	Female 22	42 (21.0%)
		Male 20	
Obese	100_109	Female 27	38 (19.0%)
		Male 11	
	110_119	Female 4	4 (2.0%)
		Male 0	
	120_129	Female 3	4 (2.0%)
		Male 1	
			199 100%

Table (7): Number and frequency of patients with different abdominal girth in supine position in different weight and gender groups.

Patients weight groups	Abdominal girth standing cm		No. and frequency
Underweight	50_59	Female 11	23 (11.5%)
		Male 12	
	60_69	Female 7	14 (7.0%)
		Male 7	
	70_79	Female 9	27 (13.0%)
		Male 18	
Normal range	80_89	Female36	52 (26.0%)
		Male 16	
Overweight	90_99	Female 23	43 (21.5%)
		Male 20	
obese	100_109	Female 25	33 (16.5%)
		Male 8	
	110_119	Female 3	3 (1.5%)
		Male 0	
	120_129	Female 3	4 (2.0%)
		Male 1	
			199 100%

Table (8): Details of Torso measurement in different weight group.

Patients weight groups	Torso	No. and frequency
Underweight	20_24 cm	2 (1.0%)
	25_29 cm	17 (8.5%)
Normal range	30_33	60 (30%)
Over weight obese	34_35	57 (28.5%)
	36_39	63 (31.5%)

Table (9): Results of correlation of abdominal girth in supine position, torso length and length of the incision with BMI ≥25 and BMI <24.9 kg\ m2.

Characteristic	Total (N.=199)	BMI≥ 25 (N.=112)	BMI<24.99 (N.=87)	P_Value
Abdominal girth standing in cm;mean±SD	86.5± 17	97.7±10.6	72.6±12.5	<0.001
Abdominal girth supine in cm;mean±SD	84± 16.6	95±10.2	70.4±12.4	<0.001
Length of wound in cm; mwan±SD	6± 1.5	6.8±1.3	4.9±0.9	<0.001
Torso; mwan±SD	33.8± 3	34.8±2.2	32.5±3.4	<0.001

Table (10): Number of patients discharged in first postoperative day and latter.

Discharge	Total	BMI <25	BMI<24.9	P value
1st postoperative day	168 84.4%	80 47.6%	86 53.3%	0.001
2st or more	31 15.6%	30 96.7%	1 3.3%	

Table (11): Need of analgesia in different weight groups.

analgesia	Total	BMI>25	BMI<24.9	P value
Single dose	156 74.4%	73 46.8%	83 53.2%	0.001
Multiple dose	43 21.6%	37 86.0%	6 14.0%	

Discussion:

The relation between the length of the incision in open appendectomy with different grades of BMI and abdominal girth needs to be investigated more as there is few articles in the literature about this subject, this paper is a trial to evaluate and clarify some aspect of this relation. More than half of the patients were female but in other studies male are more affected [22], more than half of the patient were young (10-29years) which is equal to current literature [23,7].

Patients were had different BMI groups, In overweight and obese patient, the abdominal wall thickness presents as a challenge to surgical exposure and technique and associated with wound pleated issues [23] , The length of incision needed in our patients was ranging from (3-11 cm (about 2/3rd of the patient were within normal weight (18.50-24,99 kg/m) or overweight (25.00 299kg/m) need incision (3.04.9 cm) and (5.0 5.9 cm) respectively which was statistically significant. Many factors were directly affect our decision in regarding the incision length, organ to be examined, surgical time concerned, previous abdominal surgery andBMI [25] of the patients. Bigger BMI, in overweight obese patient the needed larger incision up to 11cm in length, because of thicker abdominal wall [9].

When the patients were underweight(BMI> 18.5) or normal weight, their operation were performed by reasonable incision(5-8cm) [18,19], but in the special situation although BMI was normal or patient was underweight appendectomy done by longer incisions i,e when the position of the tip of the appendix was sub hepatic, while in study by(Sanjay KuBhasin, Rajinder Kumar agar, J.G. Langer (he finished his operation in underweight and normal Weight (excluding and same group o obese patients by length of wound incision of about(2.5-3.5 cm) [10] , and same group of patients were stayed longer in hospital and needs more than one dose of analgesia but in a study by(Enochsson L, Hellberg A, Rudberg c, et al (reveal that overweight and obese patients were stayed for longer time and require multiple doses of analgesia than normal weight [12].

Preoperative assessment of any patient showing abnormal position of the appendices, complicated appendix or tenderness point more medially made the surgeon to open by midline or right paramedian incision, which was excluded from the study. In normal weight patient we found that abdominal girth (circumference) of 36 female patient, was ranging from 80-89 cm, which was longer than normal which is up to 88 cm in female [17] , this may indicate laxity of the abdominal wall because of multiple pregnancies, inadequate exercise and mobility or high fat diet intake in the ladies in this category.

There were no mortality and negligible morbidity in the form of wound infection 4 cases normal weight (6.39%) and 2 cases of obese (4%) while in a study by (Israelsson LA, Jonsson T) given larger number of wound infection up to(10%) [26], another patient with abdominal wall hematoma she was obese, and managed conservatively. Other results like multiple dose of analgesia, period of hospital stay more than one day and time of operation in overweight and obese patients were in line to the results to other literature [12].

Conclusion:

BMI is significantly related to the length of appendectomy incision, the overweight or obese one needs alonger incision in comparison to normal range or underweight patients.

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