Comparison of superficial surgical site infection between delayed primary versus primary wound closure in complicated appendicitis

Thesis

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By

Mostafa Kamel Hussein Ghanema

M.B.B.Ch

Under supervision of

Prof. Dr. Alaa Abbas Sabry Mostafa

Professor of General Surgery

Faculty of Medicine, Ain Shams University

Dr. Mohamed Ibrahim Hassan Borai

Assistant Professor of General Surgery

Faculty of Medicine, Ain Shams University

Faculty of Medicine

Ain Shams University

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Mostafa Kamel Hussein Ghanema

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List of Abbreviations

Abb.	Full term
CDC	The Centers for Disease Control
CNS	Coagulase Negative Staphylococci
CT	Computed tomography
DPC	Delayed primary closure
MRI	Magnetic resonance imaging
MRSA	Methicillin-resistant Staphylococcus aureus
PA	Perforated appendicitis
PC	Primary wound closure
POI	Postoperative ileus
RIF	Right iliac fossa
SBO	Small bowel obstruction
SSI	Surgical site infection
USG	Ultrasonography

INTRODUCTION

The most common cause of acute abdomen in young adults is acute appendicitis. It is rare in infants and elderly but common in early adult life. Before puberty the male to female ratio is equal which increases to 3:2 at the age of 25 ***(Ahmad et al., 2014).***

Open Appendicectomy was performed through right lower quadrant transverse muscle-splitting incision. The thread ties were placed on the base of the appendix. The tied-off appendiceal stump was dunk in again with purse-string suture ***(Suh et al., 2014).***

Appendicectomy is the treatment of choice for acute appendicitis. Post-operative wound Infection can increase morbidity. Thus it can lead to increase in postoperative pain, hospital stay, sepsis and patient dissatisfaction. Non-perforated appendicitis has a reported wound infection rate of less than 10% while perforated appendicitis has an infection rate 15–20%. Infection is greatest in diffuse peritonitis (35%) ***(Ali et al., 2015).***

In the light of CDC (The Centers for Disease Control) reports, the most widespread organism responsible for the occurrence and progress of SSI is Staphylococcus aureus, followed by Escherichia coli, Coagulase Negative Staphylococci (CNS), Pseudomonas aeruginosa, Enterococcus species,

Enterobacter species, Klebsiella pneumoniae, Proteus mirabilis, Candida albicans and Streptococcus. Enlarged numbers of SSI cases have been reported with Methicillin-resistant Staphylococcus aureus (MRSA) species ***(Tariq et al., 2017).***

Surgical site infection (SSI) and its associated complications like wound dehiscence, stitch sinuses, incisional hernias, hypertrophic scar and keloid formation are not only a source of discomfort for the patients but also discouraging for the surgeons. These complications prolong the postoperative stay of patient and increase the cost of treatment In order to control and reduce the rate of SSI various wound closure techniques and prophylactic measures have been tried by the surgeons but had vague results ***(Imrana et al., 2015).***

Postoperative SSI can be minimized by reducing risk factors (e.g., smoking, or glucose control), or use of established preventive procedures (e.g., prophylactic antibiotics, avoid surgical drain, and unnecessary hair removal). Closure of the wound with delayed primary closure (DPC) for a contaminated wound also affected SSIs. Instead of closing a wound primarily ***(Siribumrungwong et al., 2017).***

Type of skin closure is one of the factors that can reduce the SSI thus reducing hospital stay of patients and in turn decreasing costs on health resources ***(Asma, 2017)***.

Delayed primary skin closure (DPC) represents a technique where no special equipment is required. It can be used when contaminated or dirty wounds are created, allowing the soft tissues to drain (and preventing accumulation of microorganisms in a confined space) before closing the skin a few days later ***(Bhangu et al., 2013).***

The procedure was claimed to decrease bacterial inoculums and increase local wound resistance from increasing wound oxygenation and blood supply from developing granulation tissue. It was firstly applied to traumatic wounds and later was more widely applied to various types of operations (e.g. colonic operations, opened tibial fractures, gynecologic operations) with demonstration of good efficacy. However, these results were mainly from observational studies that may be prone to selection and confounding biases. In addition, the DPC also has its own disadvantages including pain from routine dressing, necessity for later wound suturing, and increase cost of treatments ***(Siribumrungwong et al., 2014).***

Recent research shows that even perforated appendicitis wound can be closed primarily especially with the current antimicrobial regimes. Primary wound closure is better than delayed primary closure in terms of cosmetic outcome and patient tolerability. The most important reason for controversy between primary versus delayed primary closure after perforated appendicitis is post-operative wound infection.

Studies show that infection rates in the primary closure group and delayed primary closure are (8% 10 versus 2.7% 8 respectively) and (19% 11versus 4.2% 9 respectively ***(Ahmad et al., 2014).***

Aim of the Work

The aim of this study was to compare the efficacy of primary wound closure with delayed primary wound closure in terms of wound infection after surgery for perforated appendix and get local evidence of the effectiveness of either procedure.

Chapter 1

ACUTE APPENDICITIS

Epidemiology:

Appendicitis is the most common cause of the acute abdomen in the UK and about 10% of the population will develop acute appendicitis. It occurs in about 7% of the US population. It is suspected to be lower in incidence in African and Asian countries due to the higher fibre content in the diet. Higher fibre decreases the formation of faecoliths and hence reduces risk of obstruction. It can occur at any age but tends to be highest in the 10 to 20 age group. It is rare in infants under 3 years of age. In the paediatric population the average age of occurrence is between 6 and 10 years. It is more common in males than females. Appendicitis in pregnancy is associated with up to a 5% risk of fetal loss. This increases to 20% if perforation occurs ***(Chandrasekaran and Johnson, 2014)***.

Mortality associated with appendicitis in developed healthcare settings is estimated between 0.05 and 0.25%; however, for patients presenting with perforated appendicitis and generalized peritonitis mortality remains as high as 5%. Morbidity and mortality is increased in complex appendicitis, defined as appendicitis in the presence of a peri-appendicular abscess, gangrenous or perforated appendix ***(Sellars and Boorman, 2017)***.

Pathophysiology:

1. Obstruction of the appendiceal lumen is thought to be the initiating event in two-thirds of cases, most commonly secondary to a fecalith in adults and lymphoid hyperplasia in children.

2. With continued mucosal secretion, luminal pressure increases and eventually exceeds capillary venous and lymphatic pressures, causing venous infarction in watershed areas (middle and proximal antimesenteric regions).

3. Bacterial overgrowth occurs in the inspissated mucus.

4. Polymicrobial infection with anaerobes: aerobes 3:1

5. *Escherichia coli, Bacteroides fragilis,* and *Pseudomonas* spp. present in 80%, 70%, and 40% of cases, respectively ***(Hayes, 2018)***.

Symptoms:

The clinical history in 'classic' appendicitis is of abdominal pain associated with nausea and anorexia, followed by vomiting and in some instances, diarrhoea, particularly with pelvic appendicitis.

Whereas during the early stages the pain is located in the periumbilical region due to referred midgut pain, the pain

classically migrates to the right iliac fossa due to local peritoneal irritation. The pain is usually worse on walking or when coughing and is relieved by flexing the right hip and bringing the knee upwards to decrease psoas irritation.

In cases of perforated appendicitis with generalized peritonitis, the pain is generalized and severe. When spontaneously recounted without prompting, exacerbation of pain when the car or ambulance went over speed-humps during transit to hospital, is strongly suggestive of peritonitis ***(Chhabra and Kenny, 2018)***.

Signs:

Examination often reveals maximal tenderness over McBurney's point (one-third of the way between anterior superior iliac spine and umbilicus) with rebound/percussion tenderness and localized guarding in the right lower quadrant. Other signs which may be elicited include:

Rovsing's sign e palpation of the left iliac fossa causing pain in the right iliac fossa.

Psoas stretch sign e extension of the right thigh leads to psoas irritation and pain in the abdomen.

Obturator sign e abdominal pain on internal rotation of the right thigh ***(Abeles and Murphy, 2016)***.