INTRODUCTION

Cesarean delivery defines the birth via the abdominal route ***(Berghella, 2007)***. The World Health Organization (WHO) recommends that the rate of caesarean sections should not exceed 15% in any country ***(World Health Organization, 2009).*** However, in recent years the rate has risen to a record level of 46% in china and to levels of 25% and above in many Asian countries, Latin America and the USA ***(WHO, C. Section rate's around Globe, 2010).*** From 1970 to 2010, the cesarean delivery rate in the United States rose from 4.5 percent of all deliveries to 32.8 percent ***(Martin, 2012)***. The progressive increase in the incidence of caesarean birth has been a notable feature of contemporary obstetric practice and caesarean delivery is now the most frequent major surgical procedure performed in obstetrics and gynecology ***(Martin et al., 2002).*** In Egypt the rate of cesarean delivery is 51, 8 % of all deliveries ***(DHS, 2014).***

Cesarean delivery is one of the most common surgical procedures performed by obstetricians. Infectious morbidity after cesarean delivery can have a tremendous impact on the postpartum woman's return to normal function and her ability to care for her baby. Despite the widespread use of prophylactic antibiotics, postoperative infectious morbidity still complicates cesarean deliveries ***(Haas et al., 2014).***

Wound infection is an infrequent but serious complication of surgery. Postoperative infection often requires repeat surgery and prolonged hospitalization, and it may compromise ultimate surgical outcomes ***(Hedrick et al., 2006)***.

If prophylactic antimicrobials are given, the incidence of abdominal wound infection following cesarean delivery ranges from 2 to 10 percent depending on risk factors ***(Andrews et al., 2003; Chaim et al., 2000)*.**

Numerous good quality trials have proved that a single dose of an antimicrobial agent given at the time of cesarean delivery significantly decreases infection morbidity ***(American college of Obstetricians and Gynecologists, 2011)*.**

Wound irrigation with povidone-iodine, an antiseptic solution, may be useful for reducing infection, but it is of uncertain efficacy and risk. Povidone-iodine irrigation is a simple and inexpensive solution with the potential to prevent surgical site infection ***(Chundamala and Wright, 2007)*.**

Multiple studies investigated the use of povidone-iodine irrigation in multiple types of surgery. The infection rate was 2.9% in the treatment group and 15.1% in the control group ($p<$ 0.001). The treatment group did not experience any interference with wound healing or adverse reactions ***(Chundamala and Wright, 2007)*.**

Povidone-iodine (Betadine) is an antiseptic solution consisting of polyvinylpyrrolidone with water, iodide and 1% available iodine; it has bactericidal ability against a large array of pathogens ***(Zamora, 1986)***. Although a vast amount of literature exists regarding its use as a topical antibacterical agent in surgery, its use as a prophylactic irrigation solution against surgical site infection has been examined to a lesser degree ***(Chundamala and Wright, 2007)*.**

AIM OF THE WORK

To assess the efficacy of subcutaneous swabbing of cesarean section wounds with povidone iodine to prevent postoperative wound infection.

Chapter One

CESAREAN SECTION

Cesarean delivery defines the birth of a fetus via laparotomy and then hystorotomy ***(Cunningham, 2010)*.**

Historical Background:

Historic records that allude to the performance of cesarean section dates back as far as the fifth century BC and with favorable mother and child outcomes. The earliest report of a child who survived cesarean birth is a document describing the birth of Gorgias in Sicily in approximately 508 BC. There are no other accurate descriptions of the performance of a cesarean section or the immediate outcome of the mother or the neonate until 1610. Gabert and Bey assessed the evolution of cesarean section by dividing its development into three eras: before 1500, between 1500 and 1877, and from 1878 until the present. Before 1500, references to cesarean section are often clouded in mystery and misinformation, although some religious texts lead us to believe that cesarean sections were performed with the survival of both the mother and the infant ***(Naji et al., 2010)*.**

The Roman LexRegia, (later the Lex Caesarea) of Numa Pompilius (715–673 BC), required that the child of a mother dead in childbirth be cut from her womb. This seems to have begun as a religious requirement that mothers not be buried

pregnant and to have evolved into a way of saving the fetus. Speculation that the Roman Dictator Julius Caesar was born by C-section is apparently false as the earliest recorded survival dates to 1500 AD and Caesar's mother Aurelia Cotta lived to serve him as an advisor in his adulthood ***(US National Institutes of Health, 2009)***. Another possible source for the term is the Latin verb caedare, meaning to cut, or the term for the children who were born by postmortem cesarean sections, who were called caesones ***(Naji et al., 2010)*.**

Epidemiology:

Cesarean section rate is defined as the number of cesarean deliveries over the total number of live births, and is usually expressed as a percentage. Increasing cesarean section rates are a cause of concern in both developed and developing countries ***(Betran et al., 2007)*.**

Depending on the population and the facilities available the incidence varies in developed and developing countries. WHO indicated that a caesarean section rate greater than10-15% is not justified in any region of the world ***(Karim et al., 2011)*.**

From 1970 to 2010, the cesarean delivery rate in the United States rose from 4.5 percent of all deliveries to 32.8 percent. In 2010, this rate actually declined from a peak of 32.9 percent in 2009 ***(Martin, 2012)*.** The other, albeit brief, decline was between 1989 and 1996. This more profound decrease was

largely due to a significant increased rate of vaginal birth after cesarean delivery (VBAC) and to a closely mirrored decrease in the primary rate. These trends were short lived, and in 2007 the primary cesarean delivery rate was above30%, whereas, VBAC had dropped to 8 % ***(MacDorman, 2011)*.**

In Egypt the rate of cesarean delivery is 51, 8 % of all deliveries ***(DHS, 2014)*.**

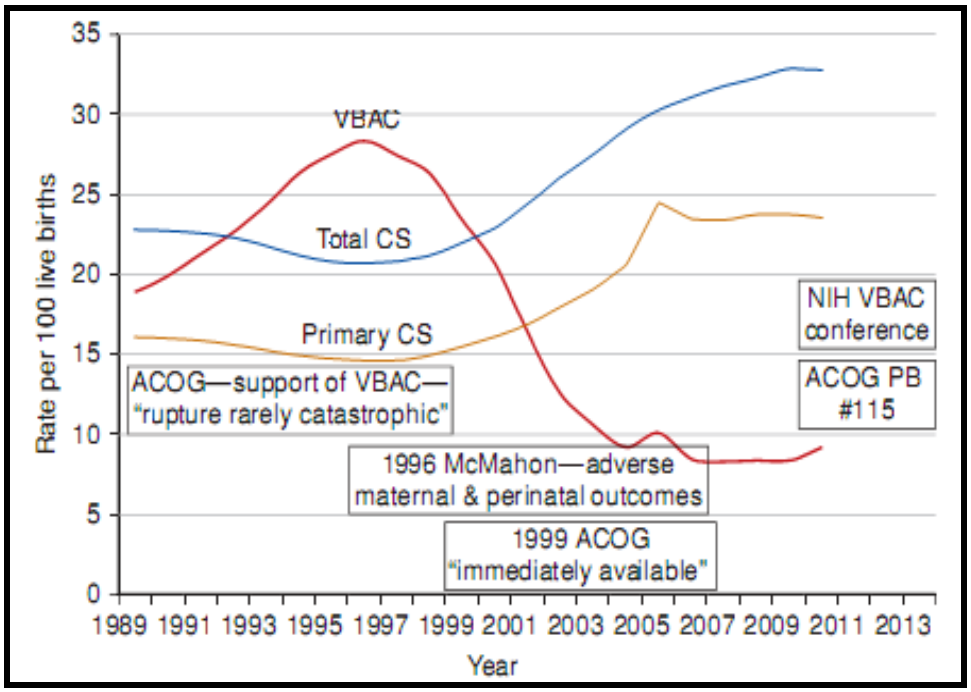

Fig. (1): Total and primary cesarean delivery (CS) rates and vaginal birth after previous cesarean (VBAC) rate: United States, 1989–2010. Epochs denoted within rectangles represent contemporaneous ongoing events related to these rates *(Data from National Institutes of Health: NIH Consensus Development Conference, 2010; Martin, 2012).*

Surgical Techniques of Caesarean Section

Ever since the wider introduction of caesarean section in the latter part of the 19th century, the safety of the procedure has improved while surgical techniques do vary from surgeon to surgeon and from time to time, good adherence to basic surgical principles and an awareness of recognized methods of doing caesarean sections will minimize morbidity ***(Kirk, 1998).***

1- Pre-operative Preparations:

The caesarean delivery will need the same pre-operative care as any major surgery plus additional consideration for the fetus.

Full informed consent must always be obtained prior to operation. The level of information discussed must be commensurate with the urgency of the procedure, and a commonsense approach is needed ***(David and Philip, 2010).***

Patients with prolonged rupture of membrane must be given an appropriate antibiotic before operation which in this cases is not considered a prophylactic antibiotic, but actually treatment of present infection ***(Danforth et al., 1985).***

2- Anesthesia:

The gestational age and medical condition of the mother must be taken into consideration prior to the choice of an anesthetic agent. For the safety of the patient, spinal or epidural

anesthesia is usually best for caesarean delivery if the clinical circumstances permit ***(Myerscough, 1982).***

3- Position of the patient:

When pregnant women near term lie in the supine position, the uterus may compress the inferior vena cava, interfering with venous return to the heart, Hence, it is standard practice that a lateral tilt of 10°C, is used while the caesarean section is performed ***(Wilkinson and Enkin, 2000).***

4- Catheterization:

Single catheterization before starting the procedure to avoid injury of the bladder is recommended. The use of an indwelling catheter after caesarean section under epidural is thought to lessen the risk of urine retention and the need for repeat catheterization ***(Hema and Johanson, 2001).***

5- Preparations of the skin:

Before surgery, the skin of the abdomen must be scrubbed at the evening with a (4%) chlorhexidinc sponge for at least two minutes. The same procedure is repeated the next morning. The pubic hair must be removed from the operative field using a disposable razor, and the skin is scrubbed with a solution of (0.5%) chlorhexidin in alcohol ***(Wilkinson and Enkin, 2000).***

6- The incisions:

(1) Skin incisions:

Length of the skin incision: Whatever the chosen incision, the length of the incision should be adequate, with a minimum width of (15) cm. is recommended, since the ease of delivery is related to the length of the incision ***(Ayers and Morley, 1987).***

A. Vertical Incision: Traditionally, both transverse and vertical incisions have been used for caesarean section (figure 1). Each type has its own advantages. A vertical midline incision allows a less vascular, rapid entry and good exposure of both the abdomen and pelvis. This incision may be indicated in cases of urgency ***(Ellis and Coleridge-Smith, 1984).***

B. Pfannenstiel Incision: This incision is extensively used because of its excellent cosmetic results, along with the benefits of early ambulation and a low incidence of wound disruption, wound dehiscence and hernia. It is made in semilunar manner, should follow a curve of semilunar skin. The average incision begins and ends (2 - 3) cm. below and medial to the anterior superior iliac spines ***(Ellis and Coleridge-Smith, 1984)*** (figure 1).

The pfannenstiel incision involves dissection of the sub-cutaneous layer and the anterior rectus sheath and, when

extended into the external and oblique muscles may result in injury to the ilio-inguinal and ilio-hypogastric nerves. In addition use of this incision limits views of the upper abdomen and may increase the blood loss and haematoma because of the increased dissection ***(Ellis and Coleridge-Smith, 1984).***

C. Maylard Incision: The Maylard incision is made approximately (1) cm. higher than the pfannenstiel incision and it involves cutting the rectus muscle transverse and ligating the inferior epigastric artery to provide good access to the pelvis (figure 1) ***(Helmkamp and Krebs, 1990).***

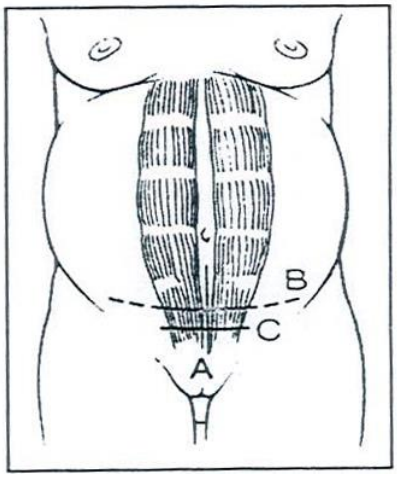

Fig. (2): (A) Vertical midline, (B) Maylard, (C) Pfanncnslici incisions (Hached line indicate possible extension) ***(Ellis and Coleridge-Smith, 1984).***

D. Joel-Cohen Incision: This incision is a straight transverse incision positioned slightly higher than the pfannenstiel about (5 - 6) cm. from the upper border of the symphysis pubis ***(Ellis and Coleridge-Smith, 1984)*** (figure 2).

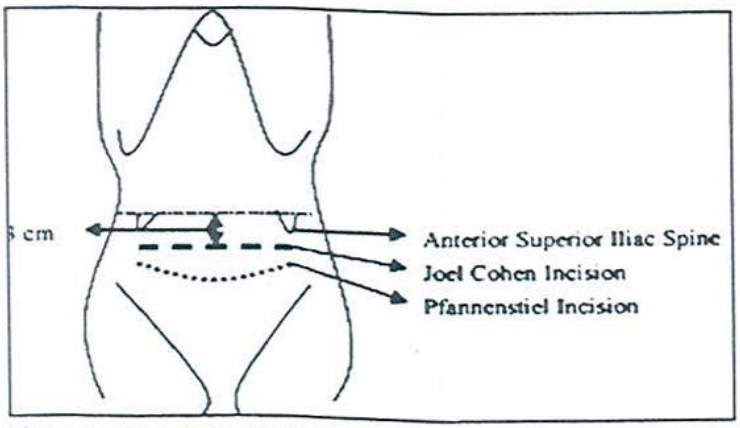

Fig. (3): Pfannenslicl & Joel Cohen Incisions ***(Xavier et al., 2005).***

The subcutaneous tissue is not sharply divided. The anterior rectus sheath is incised in the midline for (3) cm. with no separation of the rectus muscle from the rectus sheath ***(Xavier et al., 2005).***

(2) Uterine incisions

a) Lower segment transverse incision (Kerr); Ever since its introduction in 1926 by Munro Kerr, The lower segment caesarean section has been the most commonly performed uterine incision (figure 3). The uterine incision should be made in the centre for a length of (2 - 3) cm. until the membranes are exposed. Once the uterus is incised, extension of the incision may be achieved by fingers along the path of least resistance or by sharp dissection through placing the bandage scissors between the uterine wall and the surgeon finger's. Then, the uterine wall is incised laterally and slightly upward ***(Hema and Johanson, 2001).***

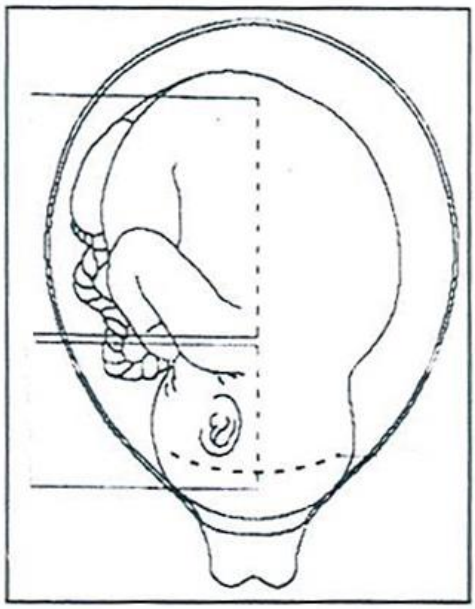

Fig. (4): Various uterine incisions; (1) Lower segment transverse incision (Kerr), (II) Lower segment vertical incision (De Lee Cornell), (Ill) Vertical midline uterine incision (Classical incision) ***(Hema and Johanson, 2001).***

When difficult circumstances are encountered, requiring an extension of the transverse incision a" **J -shaped** " extension into the upper segment, on the most accessible side is better than inverted " **T-shaped** " incision (which will form a weaker scar due to poor healing) ***(De Lee and Cornell, 1992).***

b) Lower segment vertical incision (De Lee and Cornell, 1992):
The lower uterine vertical incision introduced by ***De Lee & Cornell*** (figure 3), has the advantage of sparing the uterine vessels, but it needs careful dissection to reflect the bladder, which may nevertheless become involved in an extension. It is used in delivery of preterm infants where the lower uterine segment is not yet formed, especially preterm breech.

c) ***Classical incision:*** This is a vertical midline uterine incision that includes the upper contractile part of the uterus (figure 3). The classical upper segment vertical incision is thought to be associated with excessive blood loss, infection, poor healing and increased risk of rupture scar in subsequent pregnancy ***(Hema and Johanson, 2001).***

Indications of cesarean section

Caesarean delivery is performed when the clinician and patient feel that abdominal delivery is likely to provide a better maternal and/or fetal outcome than vaginal delivery. The term "elective caesarean delivery" should probably be eliminated because a caesarean delivery is either "medically/ obstetrically indicated" or "on maternal request," and never truly "elective" ***(Boyle et al., 2013).***

Many indications exist for performing a cesarean delivery. In those women who are having a scheduled procedure (i.e., an elective or indicated repeat, for malpresentation or placental abnormalities), the decision has already been made that the alternate of medical therapy i.e., a vaginal delivery, is least optimal.

For other patients admitted to labor and delivery, the anticipation is for a vaginal delivery. Every patient admitted in this circumstance is admitted with the thought of a successful vaginal delivery. However, if the patient's situation changes, a cesarean delivery is performed because it is believed that outcome may be better for the fetus, the mother, or both.

Indications for cesarean delivery can be divided into indications that are of benefit to the mother, the fetus, or both ***(Joy and Contag, 2010)*.**

Maternal Indications:

Maternal indications for cesarean delivery include the following:

- ***Absolute Indications:***

Repeat cesarean delivery: Despite the consequences for women's health, a repeat cesarean section (CS) birth after a previous CS is common in Western countries. Vaginal Birth After Cesarean (VBAC) is recommended for most women, yet VBAC rates are decreasing and vary across maternity organizations and countries ***(Nilsson et al., 2015)*.**

- Obstructive lesions in the lower genital tract, including malignancies, large vulvovaginal condylomas, obstructive vaginal septa, and leiomyomas of the lower uterine segment that interfere with engagement of the fetal head.

- Pelvic abnormalities that preclude engagement or interfere with descent of the fetal presentation in labor.

- Dystocia in labor is a very commonly cited indication for cesarean delivery, but it is not specific. The most common indication for cesarean section in primiparous women, accounting for 68% of cesarean sections in one