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Role of Subcutaneous Drains in Reducing Post Caesarean Section Wound Complications in Obese Women: Review Article

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ABSTRACT

Background: Obese pregnant female is at an elevated risk of developing infection of surgical site and Caesarean sections. Approximately ten percent of obese Caesarean section (CS) cases develop surgical site infections, despite the use of precautionary measures such as antibiotics. The local hypoxic response is influenced by both obesity-associated inflammation & the resultant vascular dysfunction that results. Infection of surgical site is a greater possibility to happen in cases suffer from hypoxia, which decrease the oxidative bacterial death. Obesity is a severe health concern that has a significant impact on a variety of organ functions & operations, such as wound repair, seromas, dehiscence, & hematomas, particularly following a CS**.**

Objectives: This review article to through the light on efforts to decrease postoperative complications. It is recommended that the duration of operation be reduced, antibiotics be administered during the technique, the surgical site be irrigated, & waste space be eliminated, among other measures.

Methods: Obese women, Caesarean section, Subcutaneous drains and complications were all searched by Science Direct, Google Scholar, and PubMed. The writers also assessed references from pertinent literature, although they only included the most recent or comprehensive study, which ran from January 2013 to May 2024. Documents in languages other than English were not included since there are insufficient sources available for translation. Excluded papers included dissertations, conference abstracts, unpublished publications, oral presentations, and other works not included in longer scientific investigations.

Conclusion: The results of subcutaneous tissue closure indicate that the interrupted suturing procedure is more effective than the continuous procedure in cases who suffer from obesity in terms of wound complications. However, the surgery duration is longer. Future studies must incorporate a broader range of variables that could potentially influence the outcome, as operator performance variability, pain of the wound following the operation, & cosmetic outcomes, with a more diverse cases population.

Keywords: Obese women, Caesarean section, Complications, Subcutaneous drains.

Obesity is a nightmare for any surgeon who aspires to prevent the numerous hazards & challenges that accompany his or her profession, particularly for obstetricians who encounter a diverse array of adverse pregnancy results in obese mothers [1, 2]**.** Complication of the wound may have calamitous consequences requiring numerous reoperations and an elevated death rate, rather than being a minor issue that requires only local wound management & antibiotics. Closure of the subcutaneous tissue has a possibility to lessen the risk of complications by decreasing stress on tissues, limiting the probable inactive space for blood sucking & seroma & decreasing the occurrence of post-operative wound complications [3]**.**

Although CS are the most frequently performed obstetrical operating technique, there are no established standards for the most effective skin closure techniques & materials. There have been a limited number of comparison studies conducted on a variety of closure of the skin techniques, and the results have been varied. Subcutaneous tissue closure technique is a broad area of study for obstetricians who conduct CS, particularly on obese female. In obese female who undergo CS delivery and have a minimum of two centimeters of subcutaneous fat, the utilization of closed suction drainage in the subcutaneous space can decrease the prevalence of postoperative wound complications [4]**.**

The results of subcutaneous tissue closure indicated that the interrupted suturing procedure is more effective than the continuous procedure in cases who suffer from obesity in terms of wound complications. However, the surgery duration is longer. Future studies must incorporate a broader range of variables that could potentially influence the outcome, as operator performance variability, pain of the wound following the operation & cosmetic outcomes with more diverse cases population. Variables that are currently utilized may be implemented in the future to determine the possibility of infection of wound in obese expectant female who undergo CS. This will lead to the implementation of more effective treatment protocols for obese patients including a unique preparation made before surgery, intraoperative closure procedure & postoperative care. In obese case, the interrupted suturing technique is preferable to the continuous technique in terms of wound complications for subcutaneous wound closure [5]**.**

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- **Cesarean section (CS)**

  Among all the procedures that are performed in the field of obstetrics, the delivery through CS is the most significant one, and its prevalence is increasing all over the globe. It is one of the most frequently carried out major surgeries in obstetric practice, with the goal to decrease the maternal & perinatal deaths by saving the mother and infant. As the incidence has risen dramatically over the past few years, the steadily rising global frequency of CS has become one of the most contentious issues in maternity care [(6)].

- The World Health Organization (WHO) has suggested that the population-based CS rate should be five to fifteen percent in order to achieve the most beneficial outcome. While, the global rate of CS has been rising over the previous decade, the average rate of CS in 2013 was 27% in both developed & developing countries, according to current data. If the incidence of CS exceeds ten to fifteen percent, the WHO asserts that there is no additional health benefit. In the present day, maternal desire has become known as a novel as indicators for the CS. Additionally, the recent advancements in social determinants of health, the expansion of for-profit private facilities that are capable of offering comprehensive emergency obstetric services, and enhancements in the road transportation system are all contributing factors to the elevated & increasing CS rates [(7)].

Incidence of Cesarean section:

In last decades, the incidence of CS has risen. However, this rise varies significantly between countries and within the same environment, as well as between medical institutions. The most recent Demographic and Health Surveys in the Democratic Republic of Congo (DRC) indicate that the prevalence of caesarean sections increased from four percent in 2007 to five percent in 2013. As the rate of CS rises, the relative importance of the various indications alters. Emergency Caesareans continue to be done at an excessive rate in sub-Saharan Africa, despite the fact that they have a detrimental impact on the fetal & maternal prognosis by significantly raising the associated death & morbidity. This is despite the fact that the incidences of elective caesareans are on the rise in developed countries [(8)]. The number of carried out CSs is constantly increasing. On average, over thirty percent of CSs were performed in the US in 2007. It reached sixty percent in China in 2010, and it was nearly eighty percent in Brazil's private sector. Poland has a thirty percent occurrence of CS, which is increasing at an accelerated rate [(9)].

Incidence of Cesarean section in Egypt

Compared to the 2015 Egypt Health Issue Survey, the frequency of CS conducted in the examined governorates was much greater. There needs to be a concerted effort from all sectors to ensure that elective CS protocols are adopted. The benefits and hazards of CS, as well as its medical indications, should be thoroughly communicated to pregnant female [(10)]. Cesarean section rates in Egypt have continuously climbed, accomplishing fifty-two percent of all deliveries according to the most current 2014 data, mirroring global trends [(11)].

Egyptian Demographic & Health Survey (EDHS) & representing a more than one hundred percent rise in the CS rate since 2005. The percentage of institutional-based CS in Egypt is 67.3%, which is higher than double that of Saudi Arabia & Jordan, Egypt's regional counterparts. At present, Egypt has the 3rd greatest frequency of CS in the world, succeeding the Dominican Republic (56.4% p) & Brazil (55.6%). According to the Declaration on CS Rates issued by the WHO, population-based CS rates exceeding ten percent are not considered ideal. In 2016, Egypt recorded a total of 2,600,173 deliveries, with the majority of these taking place in health facilities. The excessive medicalization of the birth process in Egypt, as observed in the excessive utilization of Caesarean delivery, is a crucial public health problem that requires immediate attention. This is because of the unneeded strain that CS places on the health system [(11)].

Indications:

There are a variety of causes why a fetus can't or should not be born vaginally. In certain cases, a vaginal birth would be hazardous, rendering certain of these indications inflexible. For instance, a Cesarean delivery is frequently the preferred method if the case has a history of uterine rupture or a prior classical Cesarean scar. Nevertheless, there has been a significant amount of research conducted in an effort to decrease the Cesarean rate, as a result of the possible complications associated with Cesarean delivery [(12)]. Efforts have been made to reduce the number of first-time Cesarean deliveries, as it is common for female who undergo a single cesarean to deliver the majority of their subsequent kid through the same procedure. She might choose for another Cesarean for a variety of causes, or she may not be a viable candidate for a successive vaginal delivery. For instance, if the case has an unfavorable cervix at term, cervical ripening through utilizing drugs including misoprostol is not advised because of the elevated risk of rupture of the uterine associated with these agents. The most frequently recorded indications for 1st -time Cesarean deliveries (aberrant fetal heart rate pattern, suspected fetal macrosomia, labor dystocia, multiple gestations, and malpresentation of the fetus) and the reduction of these factors [(13)].

Maternal indications for CS [(12)]:

- Cerebral aneurysm or arteriovenous malformation, perimortem Cesarean, previous Cesarean delivery, pelvic deformity or cephalopelvic disproportion, cardiac or pulmonary disease, previous perineal trauma, pathology requiring concurrent intra-abdominal surgery, Herpes simplex or human immunodeficiency virus infection, maternal request and prior pelvic or anal/rectal reconstructive surgery.

Uterine/anatomic indications for Cesarean [12]:
Permanent cerclage, invasive cervical cancer, previous trachelectomy, placental abruption, previous classical hysterotomy, abnormal placentation (as placenta accreta, placenta previa), genital tract obstructive mass, history of uterine incision dehiscence and prior full-thickness myomectomy.

Fetal indications for Cesarean [13]:
Thrombocytopenia, previous neonatal birth trauma, malpresentation, macrosomia, nonreasoning fetal status (as abnormal umbilical cord Doppler investigation) or abnormal fetal heart tracing and umbilical cord prolapses. In 2007, an investigation investigated the degree of additional fetal risk that a female or her caregiver deemed to be suitable in order to accomplish a vaginal delivery or prevent a CS. They arrived at the conclusion that both pregnant case & the individuals who cared for them exhibited inability to tolerate risk. It is reasonable & comprehensible for a female to have great expectations regarding the result of her delivery. The objective of lowering rates of Cesarean may be difficult to accomplish, considering this hesitance of exposing the fetus to risk **[14].**

COMPLICATIONS

Intraoperative complications:

- **Uterine lacerations:** With a transverse uterine incision, uterine lacerations, particularly those of the lower uterine segment, are more prevalent. These lacerations may extend inferiorly or laterally. They are effortlessly repaired [15].
- **Bladder injury:** This is a rare complication. It is more prevalent in recurrent Cesarean deliveries (CDs) and with transverse abdominal incisions. The bladder is most frequently injured when it is separated from the lower uterine segment or when it is introduced into the peritoneal cavity [16].
- **Ureteral injury:** The ureter is injured up to 0.1% of all Cesarean deliveries & up to 0.5% of Cesarean hysterectomies. It is expected to happen during the repair of extensive lacerations in the uterus. The most prevalent type of ureteral injury is occlusion or transection, which is typically not identified throughout the operation [17].
- **Bowel injury:** The incidence of bowel injury during Cesarean deliveries is under one percent of all deliveries. Adhesions from previous Cesarean deliveries or previous bowel surgery are the most prevalent risk factor for bowel injury during Cesarean delivery [18].
- **Uterine atony:** Uterine atony is yet another intraoperative complication that may be seen in a case who has experienced multiple gestations, polyhydramnios, or an unsuccessful attempt at a vaginal delivery in which a woman was on Pitocin augmentation for an extended duration of time [19].

Postoperative complications [20]:

- **Postpartum endomyometritis:** When it comes to cases who have undergone a Cesarean delivery (CD), this rise is significantly greater. The incidence of endomyometritis is up to twenty times greater than that of a vaginal delivery, with a documented mean of thirty-five percent to forty following CD.
- **Wound infection:** When a CD is performed, the probability of a infection of the wound ranging from 2.5% to more than fifteen percent is taken into consideration. Risk factors are comparable to those identified for endomyometritis, with the least risk correlated with individuals who have undergone a planned CD.
- **Fascial dehiscence:** Fascial dehiscence is an uncommon but sudden consequence of wound disintegration. It is recommended when there is an excessive amount of discharge from the incision and is present in about five percent of cases suffering from infection of the wound.
- **Urinary tract infections:** Urinary tract infections are the second most prevalent cause of post Cesarean febrile morbidity. An indwelling catheter is inserted during the surgical operation, which is a risk factor in itself and the prevalence is between two & sixteen percent.
- **Bowel function:** Some cases might have a gradual return of bowel function following surgery. In a small number of cases, the return of normal bowel function may be delayed by postoperative narcotics.
- **Thromboembolic complications:** These are also elevated in patients who have undergone Cesarean delivery. A deep venous thrombosis is encountered by approximately one in four hundred expectant cases. A Cesarean delivery increases the possibility of developing a thrombus by three to five times.
- **Pelvic thrombophlebitis:** Septic pelvic thrombophlebitis is an additional infection-associated complication of Cesarean delivery. This complication could appear in as many as 2 percent of cases suffering from endomyometritis or infection of the wound, and it is primarily a diagnosis of exclusion.

➢ **Wound complications** [21]:

- **Wound hematoma, seroma, dehiscence:** Blood & serum are the components of wound hematoma & seroma respectively. Hematomas are typically the result of bleeding diathesis or primary hemostasis failure, as treatment with anticoagulation.
- **Wound infection:** Wound infection typically develops between four-& seven-days following CD and is characterized by erythema, exudate, & induration of the incision. It complicates between two & seven percent of cases.
- **Necrotizing fasciitis:** Necrotizing fasciitis is an uncommon but severe infection that results in substantial morbidity following a cardiac event. It is distinguished by the quick & progressive necrosis of subcutaneous tissue & fascia. Necrotizing fasciitis is suspected in the presence of crepitus, bullous lesions wooden-hard induration of the subcutaneous tissues, severe pain, necrosis of the skin or ecchymosis, & a raised serum creatine kinase concentration. A rapid development of clinical manifestations is a defining feature of necrotizing fasciitis.
- **Endometritis:** Postpartum endometritis is the consequence of a polymicrobial infection of the decidua, which is identified by purulent discharge from the uterus, fundal tenderness, and a fever of thirty-eight Celsius degree or higher. Compared to vaginal delivery, CD has been correlated with increased risks of endometritis. Postpartum endometritis complicates the lives of two to sixteen percent of female who underwent CD.

➢ OBESITY

Obesity is the condition characterized by an excessive or anomalous accumulation of adipose tissue or fat in the body, which negatively impacts health by raising the possibility of developing diabetes mellitus, hypertension, hyperlipidemia & cardiovascular illness. This is a substantial public health epidemic that has increased in severity over the past half-century. Obesity is a multifactorial illness with a complex cause. It is the 2^{ed} most prevalent cause of mortality that could have been avoided, following smoking. In order to effectively address obesity, it may be necessary to implement a multifaceted approach and potentially necessitate continuous therapy. A substantial enhancement in the quality of life, health problem of an individual & economic & a nation can be achieved through a weight reduction of 5.5% to ten percent [22] .

Etiology: Excessive weight gain is the consequence of an imbalance among daily energy consumption & expenditure of energy, which is known as obesity. Obesity is a multifactorial condition that is impacted by a variety of genetic, cultural & societal factors. Obesity is highly heritable as evidenced by a multitude of genetic investigations that have associated it to weight gain and adiposity. Insomnia, endocrine disorders, decreased physical activity, medications, the accessibility & consumption of extra carbohydrates & foods that contain high amount of sugar, & reduced energy metabolism are additional causes of obesity. MC4R syndromes & Prader-Willi syndrome are the most prevalent syndromes related to obesity. Fragile X, Bardet-Beidl syndrome, Wilson Turner congenital leptin deficiency & Alstrom syndrome are less frequent [23].

Types of obesity

In order to determine the most effective treatments for each individual, healthcare providers utilize 3 general classes of obesity. The following are included [24]:

- Class I obesity: BMI 30 to less than thirty-five kilogram/meter^2.
- Class II obesity: BMI 35 to less than forty kilogram/meter^2.
- Class III obesity: BMI 40+ kilogram/meter^2.

Risk factors OF Obesity

Obesity is a complex illness with wide ranging causes. Obesity is the consequence of a disturbance among energy consumption & the expenditure of energy. Although the association among energy balance and obesity is fairly straightforward, the factors underlying energy balance can be very complex, & include the following [25]:

- **Physical activity/sedentary time** - Individuals that engage in little or no physical activity, particularly those who are not achieving the recommendations for activity levels laid out by the Department of Health and therefore have increased sedentary lifestyles are predisposed to a greater chance of having obesity.
- **Sedentary behaviour** - Increased sedentary behavior/bouts of prolonged inactivity are associated with adverse outcomes & increased obesity in both, adults and children.
- **Genetics** - Though genetic factors are unlikely to account for the significant rise in obesity in lately, there are a small number of genetic defects that can influence an individual's metabolism and behavior, predisposing them to obesity.
- **Environment** - Obesity is more probable to be prevalent in populations that reside in environments where there is convenient availability of accessible, delicious food. Similarly, the energy expenditure in physical activity is predicted to be minimal in areas where energy-saving technology is present, which may contribute to obesity.
- **Increasing age** - There is a "natural" rise in weight and the incidence of obesity as individuals age, although this is again related to energy balance, and

in theory at least there is nothing inevitable about this increase.

- **Ethnicity** - Obesity is more prevalent in certain ethnic groups, such as female of Afro-Caribbean descent.

Treatment of obesity:

Non-pharmacologic therapy [26]:

- **Lifestyle intervention** - It is crucial to have instituted lifestyle intervention program prior to the commencement of weight loss drug management. This program should be closely monitored by a dietitian and include ongoing monitoring, as is typically done in long-term experiments.
- **Diet** - Achieving weight loss requires strict adherence to one's diet, irrespective of the choice of diet. While very low-calorie diets may encourage quicker weight loss in the short duration, they are difficult to sustain over the long period as a result of the body's hormonal adaptation. It is essential to maintain a dietary program that maintains a negative calorie balance over a prolonged period, and the implementation of drugs treatment can assist in overcoming the stagnation that is usually noticed following the initial months of diet and lifestyle intervention**.**
- **Exercise** - Furthermore, maintaining a negative calorie balance through elevated energy consumption through physical activity is a critical component of weight loss maintenance**.**

➢ **Behavior therapy** - By modifying and following up their food intake, modifying their physical activity, and regulating stimuli in the environment, which induce binge eating, this is a critical aid for assisting case in making long-term shifts in their eating habits.

➢ **Weight-loss medicines**

Weight-loss medications are planned to be utilized in combination with diet, exercise, & behavioral modifications, rather than as a substitute for them. The medications that are administered most frequently for treating obesity involve [27]:

- Liraglutide (Saxenda).
- Or Bupropion-naltrexone (Contrave).
- listat (Alli, Xenical).
- Semaglutide (Ozempic, Rybelsus, Wegovy)
- Phentermine-topiramate (Qsymia).

➢ **Weight-loss surgery**

Common weight-loss surgeries include [28]:

- **Adjustable gastric banding:** In this technique, the stomach is separated into 2 parts by a band that is inflatable & is affixed to the exterior. The physician tightens the band, similar to a belt, to establish a narrow passageway among both pouches. The band prevents the opening from expanding. The band frequently remains in its position permanently.
- **Gastric bypass surgery.** A small pouch is created at the apex of the stomach in gastric bypass, which is also known as Roux-en-Y (roo-en-wy) gastric bypass. The new pouch is connected to the small intestine, which is then cut a brief distance under the main stomach. Food & liquid are transported directly from the pouch to this section of the intestine, circumventing the majority of the stomach.
- **Gastric sleeve:** This procedure involves the removal of a portion of the stomach, resulting in a reduced food storage capacity. It is a less intricate procedure than gastric bypass.

➢ **Gastric aspirate:** A tube is inserted through the abdomen & into the stomach during this technique. Following each meal, part of the stomach contents is removed.

➢ **Subcutaneous drains**

The subcutaneous suction drain is effective in decreasing the average length of hospital stay, surgical site infections, and wound dehiscence, which in turn decreases healthcare costs in emergency laparotomies, particularly class 3 and class 4 surgical wounds. However, bigger-group investigations are necessary to achieve better outcomes [29]. Approximately 2 decades ago, subcutaneous wound drains have been developed to remove transudate from wounds. By avoiding the accumulation of transudate from surgical incisions, these drains decrease possible dead space in the subcutaneous tissue. Subcutaneous wound drains have demonstrated favorable outcomes in a variety of surgical procedures. Nevertheless, the efficacy of wound drains in gynecological operation, as well as in Cesarean delivery, remains a topic of debate. The incorporation of a small number of cases, such as those suffering from gynecological benign diseases, the majority of investigations on wound drains in surgeries for gynecological malignancies are restricted. Additionally, there is no information available regarding the effectiveness of wound drains in gynecological malignancy, with the exception of one investigation [30].

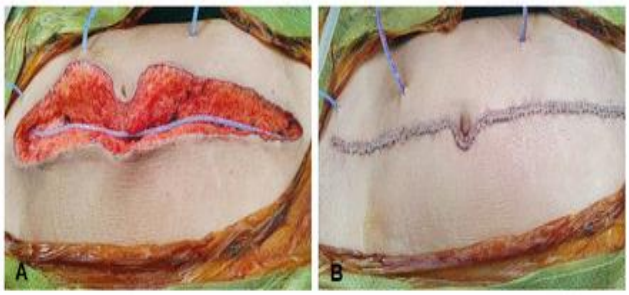

Figure 1: Subcutaneous negative pressure wound drain placement. (A) A round Jackson–Pratt drain has been implanted within the subcutaneous tissue, leaving through a separate stab surgical incision. (B) Closure of subcutaneous tissue hasn't been carried

out, & the skin has been closed utilizing stainless steel staples [31].

Figure 2: Placement of subcutaneous suction drain [32].

Drain systems are a prevalent aspect of after-operative surgical treatment. They are utilized to eliminate drainage from a wound bed, thereby preventing infection & delaying wound recovery. Drains can be located deep within an organ, duct, or cavity, as a hematoma, or they can be located on the surface of the skin. The number of drains is contingent upon the type & severity of the surgery. A vacuum system is utilized to extract fluids from a closed system, which then gathers the drainage into a reservoir. Closed systems must be drained & evaluated at least once per shift, & they must be cleansed utilizing a sterile technique in accordance with the agency's protocol [33].

Drainage tubes are made up of silastic tubes that have perforations in them to permit fluid to escape from site of the surgical wound. Alternatively, drainage tubes can be distinct puncture holes that are located near to the area of the surgery. The drainage is either collected in a confined sterile collection system/reservoir (Hemovac or Jackson-Pratt) or in an open system that discharges the drainage on a sterile dressing. The type of surgery and the site of the surgery might influence the drainage. A Hemovac vent has the capacity to accommodate up to five hundred milliliters of drainage. A Jackson-Pratt (JP) drain (Figure 4) is regularly utilized for smaller quantities of drainage (twenty-five to fifty milliliter). In order to avoid accidental removal, drains are typically sutured to the skin. The drainage location is wrapped with a sterile dressing & may be inspected on a regular basis ensuring that it is functioning properly & that there is no leakage [34].

Types of wound drainage

Drainage can be [35]:

(1) serus (clear and thin)" and it may be found in a wound that is healthy and healing.

(2) serosanguineous (the presence of blood; they may also be found in a wound that is healthy and healing).

(3) sanguineous, typically consisting of blood.

(4) The purulent (thick, white, and pus-like) appearance of the pus should be cultured since it may be an indication of an infection.

Ethical considerations: All the procedures of the research were approved by the Obstetrics and Gybecology Department and the Investigation Ethics Committee of National Medical Institute, Damanhour. Administrative consents required were taken. This study was performed in compliance with the Declaration of Helsinki, the code of ethics of the World Medical Association.

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- **Competing interests:** None.

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