

Prevention of Postoperative Adhesions of Caesarean Section

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Summary:

Adhesions means fibrous or scar tissue that results from the healing process. Up to 95% of patients who have surgery develop adhesions. Adhesions formation and its long term sequel is a well known complication of the surgery but unfortunately very little is investigated about the prevention. The long term morbidities such as chronic pelvic pain, secondary infertility, hospital readmission, bowel obstruction, difficult repeat C/S with increased bleeding, longer operative time, injury to bowel, bladder, ureters and placental accreta spectrum disorder from adhesions are the main concern. The cost for these adhesions is extreme burden for the developing countries.

Several preventive agents against postoperative adhesions have been investigated. The proper surgical technique remains the cornerstone for good outcomes and risks reduction. Careful tissue handling, keeping tissue moist, meticulous homeostasis, minimization of tissue ischaemia and avoiding excessive tissue desiccation, the use of micro and a traumatic instruments are very important to prevent the adhesive disorders. Several chemical agents, mechanical

barriers and hydrofloatation are being used which seems to be promising. But all of them have some limitations. All these Barriers are being used widely but need to be properly evaluated, before its routine use. FDA approved Barrier Sefrafilm, Hydrofloatation Adept are popular but also CoSeal, SurgiWrap and Plasmax(not FDA approved) are getting much popularity. Oxidized regenerated cellulose is promising but for C/S is not properly evaluated. The chemical barriers like NSAID, Steroids, antifibrinolytic agents and anticoagulant are being used since ancient period but they are not proved to be superior to adhesive barriers.

In the current state of knowledge, none can replace the good surgical technique. Therefore along with the training of appropriate surgical technique, preclinical or clinical studies are still necessary to evaluate the effectiveness of the several proposed prevention strategies and more researches are time demanding to prevent postoperative adhesions.

Key words: Postoperative adhesion, Caesarean section.

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Introduction:

Caesarean section(c/s) have been performed for more than 1000 years, till now this is the most common obstetric operation done all over the world(1) More than 90% of the women who undergoes 1 C/S have a repeat procedure in subsequent pregnancies². Adhesions formation and its long term sequel is a well known complication of this surgery but unfortunately very little is investigated about the prevention of these adhesions³.

Adhesions means fibrous or scar tissue that results from the healing process. This healing process occurs after injury or inflammation to the organs and tissue. If the initiating events is not too intense, the body has mechanism to heal without formation of intense adhesions. Up to 95% of patients who have surgery develop adhesions as body wants to limit the spread of the infection and anastomosis of the tissue. Most adhesions are mild and do not cause serious problems. Normal peritoneal healing involves a combination of fibrosis, fibrinolysis, and mesothelial regeneration⁴. But intense adhesions formation following C/S occurs when normal fibrinolysis process is suppressed and lead to a cascade resulting adhesion formation. The adhesions usually occurs between loops of bowel or with- bladder, vaginal wall, abdominal wall, that cause much morbidities, and is compounded by multiple C/S.

The rate of C/S is increased dramatically for last two decades. Though mortality from C/S has decreased but the morbidities especially with repeat C/S is rising and

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is very alarming. Short term complications of C/S like PPH, septicaemia, embolism, pain, blood transfusion and retention of urine all are addressed and steps of prevention are adopted in most of the cases.

The adhesions result delay and difficult in delivery of foetus, more time consuming and challenging and may increase the risks of bowel or bladder injury with excessive blood loss⁵. The costs for these adhesions is extreme burden for the developing countries.

The long term morbidities such as chronic pelvic pain, secondary infertility, hospital readmission, bowel obstruction, difficult repeat C/S with increased bleeding, longer operative time, injury to bowel, bladder, ureters and placental accreta spectrum disorder are not being evaluated properly therefore now this is high time to think how can we prevent the post surgical adhesions otherwise we have to face more maternal near miss death and also increased perinatal mortality and morbidities.

The Usual Sites of Adhesions Formation

Not only women suffer from long term sequels of post operative adhesions, the studies showed IUGR (intrauterine growth restriction), small for date, stillbirth and iatrogenic prematurity are also associated more with repeat C/S partially due to the adhesions. The exact mechanism of foetal effects is not known probably adhesions make hostile environment for the growing foetus.

Factors Causing Adhesions

Pelvic and abdominal adhesions develops after C/S, mainly due to trauma, infection, ischaemia, hypoxia of tissue, tissue desiccation, excessive manipulations, dissection of previous adhesions, presence of intra peritoneal blood and chemical irritants⁶. So obstetrician need to be careful about all these issues during the surgical technique.

There are other risk factors like reactive foreign bodies such as powder of gloves, suture materials, lint, fibers from textiles or papers all these increase the chance of

adhesions so not only surgeon but all the operative theatre staffs should be aware and need to be educated. Again patient factors can affect white blood cell and fibroblast activity such as nutritional status, anemia and some systemic disease and genetic variation are also responsible for adhesions formation. All patients who will go for surgeries or all the antenatal women need to be very well prepared physically ahead of the surgery. Systemic diseases such as diabetes, hypertension, asthma all must be controlled optimally.

Given the risk factors for adhesions formation, the surgical technique plays the most important role of prevention of adhesions. The rate of c/s is increasing as epidemic. Numerous publications in last decade have demonstrated a consistently increase rate of adhesions (>90% in some cases) following C/S and imposes huge costs for the society therefore any intervention that reduces the rate of c/s and increase the rate of vaginal deliveries will reduce the maternal morbidities from adhesive diseases due to C/S⁷.

The preventive strategies can be grouped into four categories

1. General principles.
2. Surgical techniques
3. Mechanical barriers
4. Chemical agents

General strategies for reduction of adhesions

Reducing rate of C/S by increasing NVD, ECV, Partograph use and clear-cut protocols for C/S complemented by good Governance with audit and accountability is the corner stone of prevention.

Adopting universal infection prevention procedures during surgery and prophylactic antibiotics,

Regular training and drilling for adhesions preventions program should be practiced among the O/T staff and the surgical team.

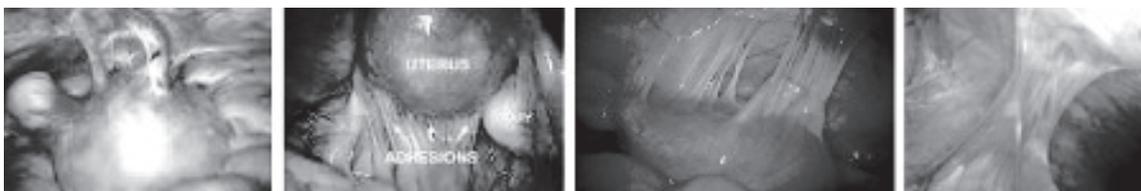


Fig.-1: Postoperative lesion adhesions of different sites in abdomen.

Limited placements of intra-abdominal foreign bodies such as patches, much suture materials.

Use of moistened abdominal drapes and swabs and occasional application of saline solution to minimize dehydration of mesothelial surfaces.

Irrigation of the abdominal cavity to remove residual intra-abdominal blood deposits prevent the adhesions.

Surgical Principles to Prevent Adhesions

The proper surgical technique remains the foundation for good outcomes and risks reduction. Careful tissue handling, keeping tissue moist, meticulous homeostasis, minimization of tissue ischaemia and excessive tissue desiccation, the use of micro and a-traumatic instruments reduces serosal injury and these all have very important role to prevent the adhesive disorders⁸.

Avoidance of peritoneal contamination with infectious agents and foreign bodies is most crucial in prevention of adhesive disease. Irrigation of peritoneal cavity and packing the gutter to limit the spread of contaminants have no proven impact on adhesions, on the other hand the presence of foreign bodies and miscellaneous debris, powdered glove is strongly associated with adhesions formation in fact US based movement aimed at banning cornstarch powder on surgical gloves⁹.

Peritoneal Closure

Huge debate is going on all around the world for the last two decades with numerous conflicting reports. During 1997 study showed that peritoneal closure is associated with increased adhesions formation (28% v/s 14%)¹⁰ also the Cochrane data base supported that study and study from the summary of 249 women concluded that closure of the peritoneum had advantages of reduced adhesions.

But this method was challenged by another meta-analysis by CHEONG and et al (in 2009) who showed that closure of peritoneum reduces adhesions formation significantly¹¹.

Again another study by HAMEL and et al (in 2007) proved that closure of rectus and peritoneum resulted significantly fewer adhesions formations¹². Similarly Myer and Bennett showed that peritoneal non closure is associated with greater incidence of adhesions formation¹³.

Very recently most powerful meta-analysis (2009_2011) was carried out by Z,SHI, et al. Their meta-analysis

provided strong evidences that closure of peritoneum (both layers), during C/S, significantly reduces the risks of adhesions formation which will be beneficial to women undergoing repeated abdominal surgeries¹⁴.

Peritoneal closure is a safe surgical technique, which carries no significant short term hazards for the mother and there is no significant disadvantages over non closure of peritoneum.

Incision Selection

Pfannenstiel incision is the standard practice but too long incision causes par aesthesia and chronic pain. The JOEL-Cohen method (1995) was thought to be associated with reduction of time of delivery, bleeding and adhesions formation. The last findings was reviewed and a very recent data in (2010) found a link between single layer and increased incidence of bladder adhesions.

Longitudinal incision for both skin and uterus has its own risks.

However it is interesting to note that Cochrane data base concluded that "while C/S is a common procedure performed on women worldwide, there is little information available regarding the appropriate incision.

Mechanical Barriers

Several preventive agents for postoperative adhesions have been investigated. Their roles are in activating fibronolysis, hampering coagulation, diminishing the inflammatory response, inhibiting collagen synthesis, or creating a barrier between adjacent wound surfaces. Many products are available in the markets but not all of them fulfill the criteria's of ideal barriers.

Properties for the ideal Adhesions Prevention Method

Ideal Barrier should achieve the tissue separation and complete coverage of adhesiogenic sites and it should remain there during the critical healing period. The adhesion barrier must not be permanent, should not require suture can be used in presence of blood and it must not compromise the healing.

But any product that is 100% effective at blocking fibrin deposition or suppressing immune function would prevent not only adhesions but also wound healing. So to choose the correct adhesive barrier is

difficult. A Cochrane review published (in 2008) entitled Barriers- reduce the incidence of adhesions following surgery in pelvic and abdominal cavity. Following barriers meet most of the criteria's. So these are FDA approved.

The adhesive barriers areas following

Sefra film the adhesion barrier used for abdominal and pelvic laparotomy. Interceed (TC7), CoSeal –mechanical adjunct in haemostasis, SurgiWrap and plasma concentrate the Pkamax are also used.

The barrier consisting of oxidized regenerated cellulose (ORC) recently been introduced which is promising. 10 studies including 500 patients the meta-analysis demonstrated that it does 24 % reduction in adhesions formation above the control group.

But the important prerequisite for using of this ORC needs meticulous haemostasis, which is not always possible in case of C/S.

Another very promising barrier the Sefrafilm approved by FDA for abdominal and pelvic laparotomy is extensively investigated. Cochrane Review of 2009 concluded that Sefrafilm reduces the incidence, extent and severity of adhesions. The Review recommended that Sefrafilm may be considered in the prophylaxis of intra-peritoneal adhesions. Sefrafilm is recommended for laparotomy. Though Sefrafilm is used in gynecological surgery and it significantly reduces the adhesions, for C/S there is a clear need for a randomized, controlled trial to investigate its efficacy. Hiroshi Fushiki had randomized controlled trials on sefrafilm for 42 women who underwent C/S. He showed clearly that sefrafilm reduces the C/S adhesions, easier delivery of babies, less time required and less bleeding during the repeat surgery¹⁵.

Sefrafilm can be used in C/S specially in high risk group.

It seems that none of the currently available methods for adhesion prevention can replace good surgical technique i.e. meticulous hemostasis, gentle tissue handling, adequate irrigation, and careful use of energy sources. So adhesive disease can be partially preventable by improving the surgical technique and the use of barrier agents in selected cases.

Many newer drugs are coming up like recombinant adhesive barrier tissue plasminogen activator and

neurokinin receptor antagonist, methyl glutaryl co-enzyme which might be an excellent choice for prevention of adhesions of C/S.

Hydrofloatation

Liquids are kept in the operative field so that it makes barrier between the organs during the healing process in an effort to float the intraabdominal structures and prevent the contact. A host of substances including Cristalloid Ringer lactate, Dextran solution, 4% icodextrin solution, Liquid hyaluronic acid, inter gel, Auto-cross hyaluronic acid and Sepracoat have been utilized. FDA approved the 4% icodextrin solution on the basis of head to head comparison with Ringer's Lactate¹⁶. Again their efficacy in C/S is not proven to be significant.

Adhesion Preventive Chemicals

Since many years the chemicals are being used are-

NSAID Drugs, Steroids agents like corticosteroids along with anti-inflammatory plus antifibrinolytic agents, Ca channel blockers, anticoagulant Heparin and Fibrinolytic agents- Plasmin and Plasminogen activators. These chemical agents are not proved to be superior to adhesive barriers.

Postoperative adhesions are major health problems with a significant economic impact. Specially repeat c/s are associated with placental disorder, peripartum hysterectomy, severe adhesive diseases leading increase incidence of readmission, bowel, bladder, and ureteric injury, intestinal obstruction, post operative drop of HB%, chronic pelvic pain and secondary infertility. We need to do researches to evaluate the effectiveness of the proposed preventive strategies with our limited resources in our perspective.

Finally to prevent the adhesive diseases — vaginal birth (VB) need to be encouraged, ECV, trial of VB after C/S, the use of partograph need to be ensured and counseling regarding risks of adhesions while discussing the mode of delivery, is important.

Conclusion:

C/S is the most common surgical procedure in our country but we need to shift to more on VB (vagina birth). All the surgical team, theater staff should have the goal to minimize the risks of adhesions during C/S. It seems that none of the currently available methods for adhesion prevention can replace good "surgical

technique". Therefore meticulous hemostasis, gentle tissue handling, adequate irrigation, universal aseptic precaution and careful use of energy sources need to be ensured. Maternal morbidities associated with adhesive disease can be prevented by improving the surgical technique and the use of barrier agents in selected cases. More research are needed for this important issue.

Further research into the mechanism underlying the formation of adhesions may allow the development of new methods of prevention, or a means of predicting which patients will develop adhesions, greatly enhancing their care.

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