

## The Role of Intralipid in the Heart Protection in Late Pregnancy

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### ABSTRACT

The occurrence of coronary artery disease in females is growing owing to alteration in lifestyle. Furthermore, acute coronary syndrome will happen more through pregnancy when women delay pregnancy until older age. In recent years, many applications of intralipids have efficaciously examined its use in critically ill patients. Some reports demonstrated that using intralipid has important role in the heart protection in late pregnancy. This brief review will summarize some main information about pregnancy-related coronary heart disease and the role of intralipid in heart protection in late pregnancy. Based on reviewed literature, more trials are still essential to clarify the basic mechanism of intralipids regarding heart protection and any resulting new applications. As a result of the side effects of opiates, intravenous acetaminophen has been recently introduced for pain management, an issue that was previously controversial in clinical practice. We aim to explore its efficacy in acute pain control, pediatric and regional anesthesia.

### KEYWORDS

Intralipid; Heart protection; Late Pregnancy.

### INTRODUCTION

Heart diseases are one of the major causes for the death of millions of people every year. The risk factors influencing it can be controlled and decreased. Indeed, managing of risk factors may convert them into protection factors. Hypercholesterolemia, hypertension, and cigarette smoking are three main factors that, if controlled, can improve the patient condition. Studies show that even patients with asymptomatic cardiovascular disease have profited from aggressive cholesterol-lowering therapy. Controlling hypertensive disease by new guidelines can also be improved [1-4]. Furthermore, according to reports former smokers have shown less risk of myocardial infarction compare to smoker persons [2, 5].

Coronary heart disease as a main health problem happen three- to four-times more often in pregnant women as compared with the non-pregnant women in this age group owing to major changes in women's lifestyle forms (pregnancy age, stress, smoking, diabetes and chronic hypertension). Such situation during pregnancy can present a major risk. Indeed, the changes in general condition during pregnancy like the cardiac, hemodynamic, hemostatic and hormonal situation lead

to the increased death rate among pregnant women with coronary heart disease. Therefore, the diagnosis and heart protection is necessary during pregnancy [3, 6, 7]. Since, the prevalence of coronary artery disease in late pregnancy (LP) has increased recently, the selection of diagnostic and therapeutic methodologies are crucial for maternal and fetal safety.

Intravenous lipid emulsion (ILE) is a new method to treat local anesthetic systemic toxicity (LAST) as well as an effective antidote for other lipophilic drug poisonings. This emulsion based material is comprised of soy bean oil, egg phospholipids and glycerin. It is available in three concentrations: 10%, 20% and 30%, yet the latter concentration has not been accepted for direct intravenous infusion [8, 9]. Recently, various applications of ILE have efficaciously been investigated in critically ill patients. This emulsion based material known as intralipid has been used as a key source of essential fatty acids for parenteral nutrition. Numerous studies have been done to identify the mechanism of this new treatment [7, 10, 11]. In recent reports, some applications of intravenous lipid emulsion therapy have evolved as a treatment for local anesthetic

toxicity. Other applications of intralipid such as ability in heart protection have also appeared in recent years. Moreover, this emulsion based therapy have been applied in other area such as in cancer therapy area or as treating unexplained recurrent spontaneous abortion [5, 8, 9, 12].

This review will summarize the available information about pregnancy-related coronary heart disease and also the role of intralipid in heart protection in late pregnancy.

### Pregnancy-Related Coronary Heart Disease

According to WHO, nearly 99% of universal maternal deaths related to pregnancy problems happen in the low-income and middle-income countries [13]. Heart diseases as a major health problem, is reported to be 3-4 times more in pregnant women as compared with the non-pregnant women in the same age group. Some women won't recognize they have bad heart situations until complications arise. Heart attacks are one of the major reasons of maternal death in the developing world. The occurrence of coronary artery disease in late pregnancy (LP) has increased in recent years triggering the introduction of new diagnostic and therapeutic modalities to ensure fetal and maternal safety [2, 6, 7].

Postpartum cardiomyopathy or peripartum cardiomyopathy is a rare form of heart failure that may happen in the last month of pregnancy. Its signs include tiredness, shortness of breath, swollen ankles, swollen neck veins, and feeling of missed heartbeats or palpitations. Pre-eclampsia is another problem affects up to six percent of women in LP. Its symptoms include high blood pressure as well as occurrence of protein in urine. Coronary artery dissection occurs when inner layers of a coronary artery tear away from the outer layer resulting in a heart attack. Eighty percent of patients suffering from coronary artery dissection are women, and 30 percent of them reported to be in LP [14].

### The Role of Intralipid in Pregnancy

Reports shows that the occurrence of heart disease in LP has increased lately owing to some important changes in women's lifestyle patterns. These reports have also revealed that myocardial infarction during LP and the peripartum is related to high maternal mortality and morbidity compared to non-pregnant women. There are some rare studies that have focused on the role of intralipid in heart protection in late pregnancy. However, some investigators have presented their study results in this regards. For example, Li et al proved that the heart of LP rodents is more prone to ischemia/reperfusion (I/R) injury compared to non-pregnant rodents. In their study, In-vivo female LP rat hearts or ex-vivo isolated Langendorff-perfused LP mouse hearts were subjected to ischemia followed by reperfusion. Their results showed that using in-

tralipid significantly reduced the in-vivo myocardial infarct size in LP rats and also protected the LP hearts against I/R injury ex-vivo. According to authors, a specific inhibitor of STAT3 known as Stattic cause to intralipid-induced cardioprotection. Their analysis also showed that caveolin 2 (Cav2) was significantly upregulated by intralipid in hearts of LP rats under I/R injury. Their other experiments revealed that Cav2 interacts with STAT3. Then, intralipid protects the heart in LP against I/R injury by inhibiting the mPTP opening through Cav2/STAT3/GSK-3 $\beta$  pathway [15]. The molecular mechanisms related to intralipid-induced cardioprotection in LP is not yet very clear. Li et al hypothesized that intralipid may protect the heart in LP by regulating the levels of specific microRNAs. They also verified that cardiac vulnerability to I/R injury extremely increases in LP rodents. This process leads to myocardial infarct size ~4 fold larger than in non-pregnant rodents. According to authors, administration of intralipid at reperfusion causes an infarct size reduction in LP rat subjected to I/R injury [16]. According to their MicroRNA-microarray analysis, the expression of MiR122 was outstandingly upregulated more than 10 fold in the heart of LP rats in intralipid group compared to control group. Their analysis showed that miR122 regulates apoptosis in cardiomyocytes subjected to hypoxia/reoxygenation since miR122-overexpression resulted in reduced apoptosis, whereas knockdown of miR122 increased apoptosis. Data showed that Pyruvate kinase isoform M2 (PKM2) and caspase 3 are two targets of miR122 since the expression of PKM2 and caspase-3 in the hearts subjected to I/R was meaningfully lower in intralipid group compared to control group in LP [16].

### CONCLUSION

Intralipids as a source of calories have been used for years, however, there are rare reports about rescuing effects in heart disease and the role of intralipid in heart protection in late pregnancy. Therefore, more trials are vital to explain the basic mechanism of intralipids concerning to heart protection and subsequent novel applications.

### CONFLICT OF INTEREST

The author declares no conflict of interest.

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