Effect of Autologous Fibrin Gel and Platelet Rich Plasma activated by Ozone versus those activated by Calcium Chloride on wound healing and prevention of infection in High Risk Cesarean Sections: Randomized Controlled Study

Thesis

Submitted for Partial Fulfillment of the Requirements of master degree in Obstetrics and Gynecology

By

Marwa Said Mahmoud Wanas

M.B.B.CH, Alexandria University (2009)
Obstetrics and gynecology resident, Maternity Hospital, Alexandria

Under supervision of

Prof. Mohamed El-Mandooh Ibrahim

Professor of Obstetrics and Gynecology,
Faculty of Medicine, Ain Shams University

Dr. Waleed Mohmed Khalaf

Lecturer of Obstetrics and Gynecology,
Faculty of Medicine, Ain Shams University

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وقل اعملوا
فسيرى الله عملكم ورسوله والمؤمنون
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First and foremost, I feel always indebted to ***Allah,*** *the most kind and the most merciful.*

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Marwa Said Wanas

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LIST OF ABBREVIATIONS

PRP	:	Platelet Rich Plasma
GFs	:	Growth Factors
MSC	:	Mesenchymal Stem Cells
$CaCl_2$	:	Calcuim Cloride
PGF	:	Platelet Growth Factor
CS	:	Cesarean Section
WHO	:	World Health Organization
BMI	:	Body Mass Index
DM	:	Diabetes Mellitus
ACOG	:	American College of Obstetricians and Gynecologists
TGF-β	:	Transforming Growth Factor beta
TGF-α	:	Transforming Growth Factor alpha
ADP	:	Adenosine Di Phosphate
ATP	:	Adenosine Tri Phosphate
PDGFs	:	Platelet Derived Growth Factors
IL-1	:	Interleukin-1
FGF	:	Fibroblast Growth Factor
EGF	:	Epidermal Growth Factor
VEGF	:	Vascular Endothelial Growth Factor
BMPs	:	Bone Morphogenic Proteins
PG	:	Platelet Gel
TKR	:	Tyrosine Kinase Receptor
bFGF	:	Basic Fibroblast Growth Factor
CTGF	:	Connective Tissue Growth Factor
PR	:	Prospective Randomized
R-case	:	Retrospective case
PR-B	:	Prospective Randomized Blinded
P-contr	:	Prospective study with controls
R-contr	:	Retrospective study with control patients

P-control-B	:	Prospective consecutive study, single Blinded
M-F	:	Maxillo-Facial surgery
WC	:	Wound Care
SS	:	Spinal Surgery
ES	:	Eye Surgery
OS	:	Orthopedic Surgery
CTS	:	Cardio Thoracic Surgery
VAS	:	Visual Analogue Scale
REEDA	:	Redness Ecchymosis Edema Discharge Approximation
VSS	:	Vancouver Scar Scale
O_3	:	Ozone gas
AHT	:	Autohemotherapy
LOP	:	Lipid Ozonation Products
NO_2	:	Nitrous Oxide
AAP	:	Arachidonic Acid Peroxides
LP	:	Lipid Peroxidation
AOS	:	Antioxidant Defense System

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Protocol of thesis

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INTRODUCTION

Cesarean delivery, one of the most common major surgical procedures performed worldwide used for 15% of births around the world and it continues to increase in frequency. **(Betran et al., 2007)**

It is an important contributor to surgical site complications such as infection, hematoma, seroma, dehiscence, and pain.

Several risk factors affect the wound healing process in cesarean sections, including: (1) twin birth, (2) chronic systemic disease (diabetes, hypertension, and immune deficiencies), (3) obesity, (4) previous incision, (5) corticosteroid therapy, (6) immunosuppression treatment, and (7) anemia. **(Andrews et al. 2007)**

Platelet Rich Plasma (PRP) is a volume fraction of blood having a high concentration of platelets above the baseline that markedly improves the adhesive properties and the process of wound healing. **(Mehta and Watson , 2008)**

When the platelets are activated, various growth factors (GFs) and other bioactive proteins are released and those proteins augment tissue repair and regeneration processes. **(Takikawa et al, 2011)**

In vitro studies on the proliferation of mesenchymal stem cells (MSC) confirmed that PRP improves MSC proliferation and differentiation, suggesting a high regenerative potential of PRP. **(Mishra et al, 2009)**

When platelet rich plasma is combined with thrombin and calcium chloride, platelet gel is created. This product is a rich source of growth factors. (**Oz et al, 1993)**

Autologous fibrin glue (gel) mimics the last steps in the coagulation cascade with the conversion of fibrinogen to fibrin with the help of thrombin and calcium, helping cross-link the fibrin into a stable clot. Therefore, helps achieve hemostasis even in the presence of coagulation defects. **(Tawes et al, 1990)**

The role of autologous fibrin glue is to obtain hemostasis and "glue down" the wound edges**.(Oz et al, 1992)**

PRP is activated endogenously when it comes in contact with collagen or exogenously before injection commonly by: thrombin, $CaCl_2$ or medical Ozone.**(Ruhi Cakir, 2014)**

There is no evidence of wound infections after PRP applications have been reported, although the preparation of PRP demands many processing steps, and thus theoretically, there is the possibility of contamination. **(Kevy and Jacobson, 2004)**

Therapeutic medical Ozone is a mixture of pure oxygen and ozone in micrograms doses. It can kill all kinds of bacteria, viruses and molds by 99.9%. **(Ruhi Cakir, 2014)**

Incubation (2 h) of PRP with medical Ozone increases the basal concentration of Platelet Growth Factor (PGF) approximately 600%. The broad beneficial effect of ozone has become evident in orthopedics, cutaneous and mucosal infections. The induction of PGF and other growth factors by ozone can support and potentiate those applications. **(Martínez-Sánchez et al, 2010)**

AIM OF THE STUDY

The purpose of this study is to compare the effect of application of autologous Fibrin Gel and Platelet Rich Plasma (PRP) activated by medical Ozone (Ozonated PRP) versus those activated by $CaCl_2$ on wound healing and prevention of infection in high risk cesarean sections.

Research hypothesis

In high risk women undergoing cesarean section, application of ozonated PRP and fibrin gel may be similar to those activated by CaCl2 in wound healing and prevention of infection.

Research Question

In high risk women undergoing cesarean section, does application of ozonated PRP and fibrin gel may be similar to those activated by $CaCl_2$ in wound healing and prevention of infection?