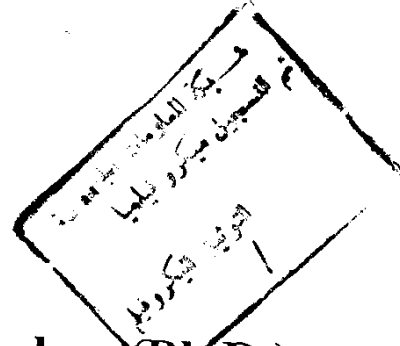


**EXPERIMENTAL STUDIES ON
THE RESPONSE OF THE SKIN AND
SUBCUTANEOUS TISSUE TO THE
DIFFERENT SURGICAL SUTURE
MATERIALS AVAILABLE IN EGYPT**

Supervised by
Prof. Dr.

Madeha Abd El-Moneim Ashry (Ph.D.)

*Professor of Histology & Histochemistry,
College for Girls, Ain Shams University*



Prof. Dr.

Mohamed Galal Ez El-Dein, (FRCS, Ed.)

*Consultant, General Surgery, G.I.T., & Tumors,
Head of Surgery Departments, El-Sahel Teaching Hospital.*

**COLLEGE FOR GIRLS
AIN SHAMS UNIVERSITY
1994**



"سبحانك لا علم لنا إلا ما علمتنا
إنك أنت العليم الحكيم

صدق الله العظيم

سورة البقرة

آية (٣٢)



Acknowledgement

*First, and foremost, I feel always indebted to **GOD**, the most kind and the most merciful. Thanks to "who made me able to accomplish this work.*

*Words do fail me to express my sincerest appreciation to **my parents** and also I would like to express my thanks to them for their help and cooperation.*

*It is with great honor that I take this opportunity to record my appreciation and heartfelt gratitude to the Noble character and gentle behavior of **Prof. Dr. Madeha Abd El Moneium Ashry**, Professor of Histology and Histochemistry, Department of Zoology, Faculty of Girls, Ain Shams University. So I wish to thank her, for all the time she devoted for reading and correcting the manuscript. Her advice and support are deeply appreciated, without whose valuable supervision. this work, wouldn't come to light. Her continuous in time. And I would like to express my deepest an cordial appreciation to her whose motherly guidance has shown me any may in this work.*

*I am deeply indebted to **Dr. Mohamed Galal Ezz El-Dein**,*

Consultant, General Surgery , GIT & Tumours, and Head of Surgery Depeartments, El-Sahel Teaching Hospital, for suggesting and planning this work, and he was very generous in time and effort. He followed closely the progress of this thesis with never failing interest, facilitating all of the problems which had come up. No words can satisfy and explain my deepest gratitude for his faithful supervision, enthusiastic cooperation, continuous encouragement, guidance and support from the beginning to the end of this work. He supplied me with a lot of his time and own experience. Without his kind help and advice, this work would not have come to light. It is a pleasure to work under his supervision.

*I would like to express my deepest gratitude and respect to **Dr. Ibrahim Fayez Elias**, Head of Department of Medical Registration and Statistics, El-Sahel Teaching Hospital, for his fatherly care, constructive criticism throughout the whole work. Also I wish to express my everlasting gratitude to him, for his valuable advice and concrete help in the statistical analysis of the results, and the final layout of this work.*

I would like to express my thanks to all the staff members of the Department of Zoology, College for Girls, Ain Shams Universtiy, my colleagues and to every person in the Surgery Department in El-Sahel Teaching Hospital for their continuous support cooperation and help. Indeed I shall not forget them all my life.

I should also like to thank all those who generally gave me time and effort to help me accomplish this work.

THE PREMASTER STUDIES

- **Histology**
- **Histopathology**
- **Physiology**
- **Invertebrates (Zoology)**
- **Statistics**
- **English Language**

ABSTRACT

The aim of the present study was to differentiate the reaction of the skin and subcutaneous tissue; and blood to the different suture materials available in the Egyptian market. These suture materials included; Absorbable: Plain- and Chromic-Catgut, Vicryl (mucopolysaccharide), and PDS (Polydioxanone); and Non-absorbable: Ethilone, Silk, Prolene (Monofilament Nylon), and Stainless Steel.

LIST OF ABBREVIATIONS

1 h	First hour
2 h	Second hour
ABP	Anastomotic Bursting Pressure
B.C.	Before Christ
Ch. Catg.	Chromic Catgut
Cm	Centimetre
Cont.	Continuous
E.S.R.	Erythrocytic Sedimentation Rate
F.A.V.	Fast Absorption Vicryl
H & E	Haematoxylin and Eosin
Hb	Haemoglobin
g	Gram
Kg	Kilogram
MG	Mammary Gland
min	minutes
ml	millilitre
n	number
PDS	Polydioxanone
PDX	Polydioxanone
PGL	Native Analogue of Vicryl
PPL	Polypropylene
P.C.V.	Packed Cell Volume
R.B.Cs.	Red Blood Cells
SEM	Scanning Electron Microscopy

TAPVD	Total Anomalous Pulmonary Venous Drainage
TRS	Tissue Response
U	Micron
ULC	Appose metal stapler
Um	Micrometre
W.B.Cs.	White Blood Cells
X 40	Magnification 40 times

CONTENTS

	<i>Page</i>
INTRODUCTION AND REVIEW OF LITERATURE	1
GENERAL CLASSIFICATION OF SURGICAL SUTURE	
MATERIALS	4
LOCAL EFFECTS OF SURGICAL SUTURE MATERIALS	5
MONOFILAMENT SURGICAL SUTURE MATERIALS	11
ABSORBABLE/ NON-ABSORBABLE SURGICAL	
SUTURE MATERIALS	14
SYNTHETIC SURGICAL SUTURE MATERIALS	16
STANDARDS FOR SURGICAL SUTURE MATERIALS	18
COMMONLY USED SUTURE MATERIALS IN SKIN	
SURGERY:	
(1) Catgut	20
(2) Nylon, TEFLON, DACRON, NOVATIL	25
(3) Polydioxanone (PDS / PDX)	27
(4) Prolene	36
(5) Silk	46
(6) Stainless Steel	49
(7) Vicryl	51
GENERAL COMPARISON BETWEEN SURGICAL	
SUTURE MATERIALS	55
MATERIAL AND METHODS	59
RESULTS	78
DISCUSSION	181
CONCLUSION	194
SUMMARY	196
REFERENCES	200
ARABIC SUMMARY	

LIST OF TABLES

	<u>Page</u>
Table (1): Advantages and disadvantages of Catgut	23
Table (2): Influence of wound infection on late wound failure in 580 patients reviewed at 1 year	31
Table (3): Properties, advantages and disadvantages of Polyglycolic acid and Polyglactin (absorbable)	57
Table (4): Properties, advantages and disadvantages of Polyester suture	58
Table (5): Group distribution	63
Table (6): Haematological data of different sutures under study in days 2, 7 & 14 after stitching	81
Table (7): Mean Haemoglobin according to type of suture at days- 2, 7 & 14 after stitching	83
Table (8): Mean R.B.Cs. count according to type of suture at days- 2, 7 & 14 after stitching	87
Table (9): Mean P.C.V. according to type of suture at days-2, 7 & 14 after stitching	91
Table (10): Mean W.B.Cs. count according to type of suture at days- 2, 7 & 14 after stitching	95
Table (11): Mean E.S.R. (hour 1) according to type of suture at days-2, 7 & 14 after stitching	99

LIST OF TABLES (Cont.)

	<u>Page</u>
Table (12): Mean E.S.R. (hour 2) according to type of suture at days-2, 7 & 14 after stitching	103
Table (13): Scoring for healing process (according to histopathology) at day-14 for the different sutures under examination	180
Table (14): Scoring for local tissue reactions at day-14 for the different sutures under examination	180

LIST OF FIGURES

	<i>Page</i>
Fig. (1): Chemical structure of PDS	28
Fig. (2): Percent changes in Hb by duration in days using different sutures	84
Fig (3): Hb after 2, 7 & 14 days using different sutures	85
Fig. (4): Percent changes in R.B.Cs. by duration in days using different sutures	88
Fig. (5): R.B.Cs. count after 2, 7 & 14 days using different sutures	89
Fig. (6): Percent changes in P.C.V. by duration in days using different sutures	92
Fig (7): P.C.V. after 2, 7 & 14 days using different sutures	93
Fig. (8): Percent changes in W.B.Cs. by duration in days using different sutures	96
Fig (9): W.B.Cs. count after 2, 7 & 14 days using different sutures	97
Fig. (10): Percent changes in E.S.R. (1h.) by duration in days using different sutures	100
Fig (11): E.S.R. (1h.) after 2, 7 & 14 days using different sutures	101
Fig. (12): Percent changes in E.S.R. (2 h.) by duration in days using different sutures	104
Fig (13): E.S.R. (2 h.) after 2, 7 & 14 days using different sutures	105
Fig. (14): Low-power view of skin section in the control group (H & E, x40)	107

LIST OF FIGURES (Cont.)

	<i>Page</i>
Fig. (15): High-power view of integument in the control group (H & E, x100).	108
Fig. (16): Photomicrograph of integumental section 2 days-post- stitching with Chromic Catgut (H & E, x40)	116
Fig. (17): Photomicrograph of skin section, 2 days after stitching with Ethibond, (H & E, x40)	117
Fig. (18): High-Power view of skin section in the Ethibond suture zone, after 2 days, (H & E, x100)	118
Fig. (19): Low-power view of skin section with Ethilone suture zone after 2 days (H & E, x40)	119
Fig. (20): High-power view of skin section in Ethilone suture zone after 2 days, (H & E, x100)	120
Fig. (21): Photomicrograph of skin section, 2 days after stitching with Plain Catgut, (H & E, x40)	121
Fig. (22): Photomicrograph of integumental section 2 days post- stitching with Polydioxanone (H & E, x40)	122
Fig. (23): High-power view of skin section in Polydioxanone (P.D.S.), after 2 days (H & E, x100)	123
Fig. (24): Photomicrograph of skin section, 2 days after stitching with Prolene (H & E, x40)	124