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RECENT ADVANCES IN BURN MANAGEMENT

Essay

Submitted by

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TBSA	Total Body Surface Area.
CO	Cardiac Output.
SIRS	Systemic Inflammatory Response Syndrome.
SVR	Systemic Vascular Resistance.
PVR	Pulmonary Vascular Resistance.
GIT	Gastro-Intestinal Tract.
ACS	Abdominal Compartment Syndrome.
IAH	Intra-Abdominal Hypertension.
RBF	Renal Blood Flow.
GFR	Glumerular Filtration Rate.
ICP	Intra-Cranial Pressure.
FRC	Functional Residual Capacity.
BPP	Boiled Potato Peel.
ICG	Indo-Cyanine Green.
LDPM	Laser Doppler Perfusion Monitoring.
LDI	Laser Doppler Imaging.
LDPI	Laser Doppler Perfusion Imaging.
MIBI	Methoxy-Iso-Butyl-Isonitrile.
Tc	Technetium.
ABA	American Burn Association.
BUN	Blood Urea Nitrogen.
LR	Lactated Ringer.
HLS	Hypertonic Lactated Saline.
D_5W	5 percent dextrose in water.
PALS	Pediatric Advanced Life Support.
CVP	Central Venous Pressure.
PAC	Pulmonary Artery Catheter.
PT	Prothrombin Time.
PTT	Partial Thromboplastin Time.
DIC	Disseminated Intravascular Coagulation.

MEBO	Moist Exposed Burn Ointment.
SSD	Sliver-Sulpha-Diazine.
CK	Creatinine Kinase.
LDH	Lactated De-Hydrogenase.
SGPT	Serum Glutamic-Pyruvic Transaminase.
CPK	Creatinine Phospho-Kinase.
CK-MB	Creatine Kinase Myocardial Band.
SSG	Split-thickness Skin Graft.
FSG	Full-thickness Skin Graft.
ABG	Arterial Blood Gases.
ARS	Acute Radiation Syndrome.
CEA	Cultured Epithelial Autografts.
CSS	Cultured Skin Substitutes.
ECM	Extra-Cellular Matrix.
BDS	Bilayer-Dermal Substitute.
VAC	Vacuum Assisted Closure.
ADM	Acelluar Dermal Matrix.
AIDS	Acquired Immune-Deficiency Syndrome.
PRP	Platelet Rich Plasma.
GFs	Growth Factors.
EGF	Epidermal Growth Factor.
PDGF	Platelet Derived Growth Factors.
TGF	Transforming Growth Factor.
KGF	Keratinocyte Growth Factor.
FGF	Fibroblast Growth Factor.
VEGF	Vascular Endothelial Growth Factor.
CTGF	Connective Tissue Growth Factor.
GM-CSF	Granulocyte/Macrophage Colony-Stimulating Factor.
IGF	Insulin-like Growth Factor.
TNF	Tumour Necrosis Factor.
IL	Inter-Leukin.
PG	Prosta-Glandin.

PDRNs	Poly-Deoxy-Ribo-Nucleotides.
COX	Cyclooxygenase.
NO	Nitric Oxide.
NADPH	Nicotinamide Adenine Dinucleotide Phosphate.
HLA	Human Leucocytic Antigine.
HBO/ HBOT	Hyperbaric oxygen therapy.
SAP	Sub-Atmospheric Pressure.
NPWT	Negative Pressure Wound Therapy.
DD	Degree of Deacetylation.
PVA	Poly-Vinyl Alcohol.
iPSCs	Induced Pluripotent Stem Cells.
SC	Stem Cells.
ESC	Embryonic Stem Cells.
ASC	Adult Stem Cells.
HSCs	Hematopoietic Stem Cells.
BMSCS	Bone Marrow-Derived Stem Cells.
ADSCS	Adipose Tissue-Derived Stem Cells.
MSCs	Mesenchymal Stem Cells.

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I. Introduction

Burn trauma is as old as the discovery of fire in the history of mankind and medicine is built on the best of the past.

A burn is a type of injury (coagulative necrosis) caused by heat, electricity, chemicals, light, radiation or friction to skin and deep tissues.

Burn injuries represent one of the most important public health problems faced by both developing as well as industrialized nations today, it's also an extremely stressful experience for both the victims as well as their families physically, psychic and financially.

Study of 'history of burns' contributes to a review of accomplishments and errors, it teaches us where we started from, where we stand today, in what direction we are marching and guides us for the future, in an address to the Royal College of Surgeons, Churchill remarked; "The longer you look back, the further you can look forward".[(1)]

History of Burns:

In considering the history of the treatment of burn injuries **in the ancient ages,** Hippocrates (430 BC) used swine's semen, resin, bitumen and Oak bark solutions in the treatment of burns.

Chinese (600-500 BC) used extracts of tea leaves.

Smith papyrus (1500 BC Egyptians) used gum and goat's milk mixed with mother's milk and strips soaked in oil.

Celsius (ancient Rome) advocated honey and bran.

Glen (ancient Rome) described vinegar or wine in treatment of burns. [(2)]

In the middle ages Clowes (1596) wrote on gun powder burns, and described multiple types of therapy on different body parts and also suggested oily dressings containing many drugs.

Fabricus Hildanus (1610) was the first to classify burns into three categories and also showed pictorially the early successful surgical release of hand contractures.

H Earle (1799) described the use of ice and iced water for analgesia and the prevention of edema.

Lisfranc (1835) described calcium chloride dressings. [2]

However **in the modern ages** of burns history Cotton dressings were first discussed in a Glasgow medical journal (1928).

By (1930) the understanding of burn pathology took a great leap forward when Underhill studied a group of patients and analyzed content of blister fluid and determined that burn shock was due to fluid loss and not due to toxins.

Since 1942 extensive studies by Cope and Moore was done for treating burn shock.

Dressings remained popular until Wallace advocated exposure for face, buttock and perineum (1949).

Formulas gradually evolved calculating fluid losses, Evans (1952) used burn surface area and weight as the principle variable, Moyer *et al* introduced first crystalloid only resuscitation (1965), Brooke formula was a modification of Evans formula and utilized salt, colloid and water. [3]

In the early 1970's Charles Baxter developed the Parkland formula which determined that patients required 4 ml/kg/%TBSA burns in the first 24 hours and it is most frequently used today. [4]

Also in the early 1970's Monafo started examining the efficacy of using a hypertonic saline solution for resuscitation and the concept was that it would shift fluid from intracellular to intravascular space, by 1990's Warden suggested the use of modified hypertonic resuscitation using LR solution. [4]

Today tremendous advances have been made in the management of burn injury in the past twenty five years. Mortality and morbidity have been markedly reduced due to overall major improvements in critical care, metabolic support, infection control, fluid resuscitation strategies and wound management. [5]

Skin Anatomy and Histology:

Understanding a burn injury requires recognition of anatomy and physiology of the skin. [6]

Skin is the largest organ, covering a surface area of 1.5 to 2.0 m^2 in an adult;[7] it's a bilayer organ with many protective functions essential for survival (Figure 1.1)[6]

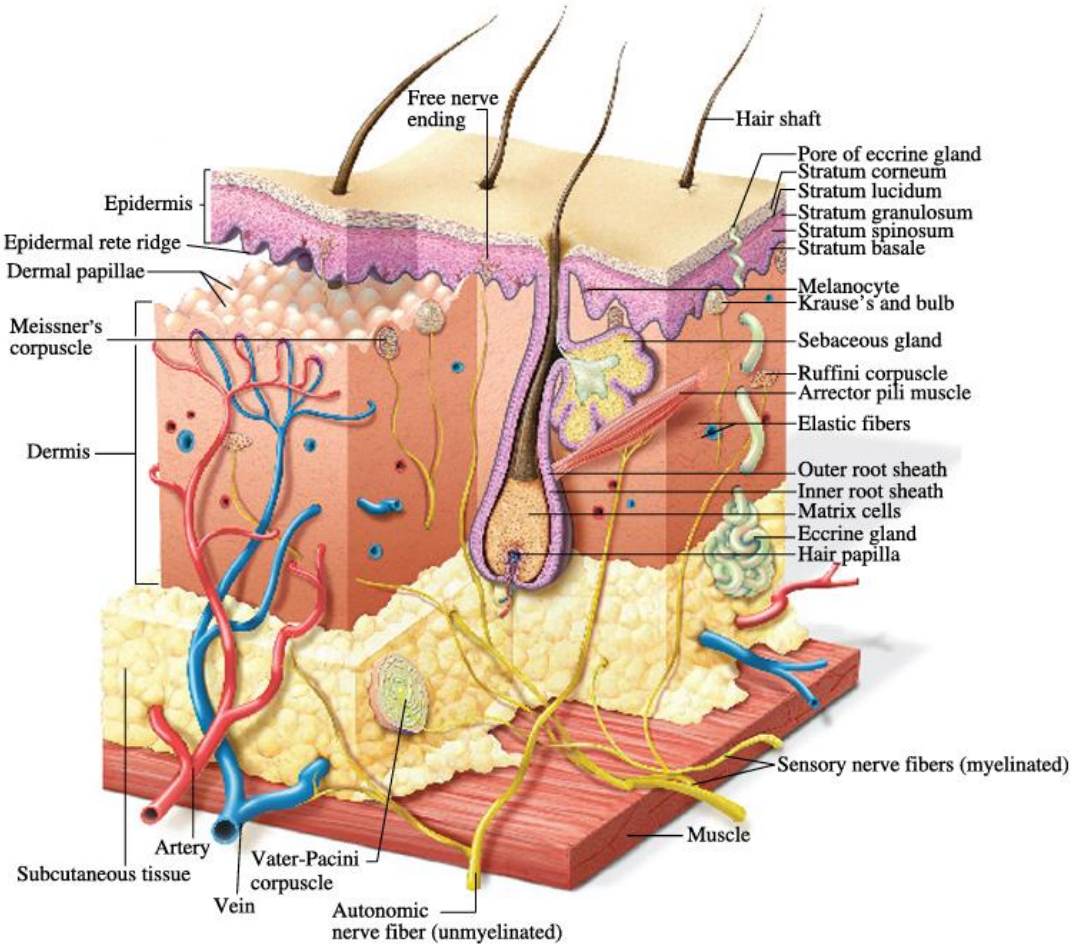

Figure 1.1 Anatomy of normal skin. [6]

Skin consists of thin outer layer ectodermal in origin "the Epidermis" and a thick fibrous inner layer mesodermal in origin "the Dermis", the two layers are separated by a basement membrane or basal lamina. [7]