A COMPARATIVE STUDY OF THE EFFICACY OF HUMAN PLACENTAL EXTRACT OVER COLLAGEN SHEETS IN 20 – 40% PARTIAL THICKNESS BURNS

Dissertation submitted in partial fulfillment of regulation for the award of M.S. Degree in General Surgery

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The Tamil Nadu

Dr. M.G.R. Medical University

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THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

CHENNAI

APRIL 2020

Coimbatore Medical College

Coimbatore - 641 014

CERTIFICATE

This is to certify that this dissertation titled **"A COMPARATIVE STUDY OF EFFICACY OF HUMAN PLACENTAL EXTRACT OVER COLLAGEN SHEETS IN 20-40% PARTIAL THICKNESS BURNS"** is the bonafide work done by **DR AZEEZA FATHIMA H** and submitted in partial fulfillment of the requirements for the Degree of M.S., General Surgery, The Tamil Nadu Dr. M.G.R. Medical University, Chennai

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DECLARATION

I certainly declare that this dissertation titled **"A COMPARATIVE STUDY OF EFFICACY OF HUMAN PLACENTAL EXTRACT OVER COLLAGEN SHEETS IN 20-40% PARTIAL THICKNESS BURNS"** is a genuine work of mine. The contribution of any supervisors to the research are consistent with normal supervisory practice and are acknowledged.

I also affirm that this bonafide work or part of this work was not submitted by me or any others for any award, degree or diploma to any other university board, neither in India or abroad. This is submitted to The Tamil Nadu Dr. MGR Medical University, Chennai in partial fulfillment of the rules and regulation for the award of Master of Degree in General Surgery.

Place: DR AZEEZA FATHIMA H

Date:

ETHICAL COMMITTEE APPROVAL CERTIFICATE

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CERTIFICATE OF APPROVAL

To
Dr.Azeeza Fathima
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Dear **Dr.Azeeza Fathima**

The Institutional Ethics Committee of Coimbatore Medical College, reviewed and discussed your application for approval of the proposal entitled **"Comparative study of efficacy of placental extract and collagen sheets in 20-40% partial thickness burns in Coimbatore Medical College, Coimbatore."**No.0104/2017.

The following members of Ethics Committee were present in the meeting held on 28.11.2017.conducted at MM - II Seminar Hall, Coimbatore Medical College Hospital Coimbatore-18

1	Dr.S.Ramalingam MD, Dean, PSG IMS&R, Cbe	Chairman
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11	Mrs.A.Sharmila BA., BL., Advocate	Legal Expert
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13	Dr.G.Vani Ganesh M.Sc.,Ph.D., Tutor in Medical Surgical Nursing, CMCH, Cbe	Scientific Member
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15	Mr.V.A.Shahul Hameed, +2	Lay-Person

We approve the Proposal to be conducted in its presented form.

Sd/Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary

MEMBER SECRETARY
INSTITUTIONAL HUMAN ETHICS COMMITTE
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COIMBATORE - 641 014.

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I wish to thank all my colleagues who have helped me in the preparation of this dissertation. Above all I would like to thank my parents for their love and

support. I extend my heartfelt thanks to all the patients who co-operated for this study.

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INTRODUCTION

One of the greatest discoveries of mankind is the art of making and maintaining fire. Burns injuries have been around since early days and the various ways to treat burns have been evolving since then. Injuries due to burns are complex and the ideal treatment requires multidisciplinary approach. Patients suffer with fatal morbidities such as irregular scars, functional and psychological disorders.

Burn injuries pose a major public health problem worldwide especially in developing countries like India with an incidence of one lakh population per year. Among the burn injuries thermal injuries are more common. These burn injuries lead to great loss to the country due to lost working man hours.

In India, there are about 7-8 lakh hospital admissions with burns as compared to 40,000 in USA and 13,000 in UK. Since greater than 1,20,000 deaths occur due to burns injury every year in India, Experts of American Association of Physicians of Indian Origin (AAPI) have created protocols for the treatment of burns. These protocols guide in resuscitation of patients with intravenous fluids and in choosing appropriate antibiotics.

The improved insight into the pathophysiology of burns and recent advances in the management of burns leads to better life expectancy, but often some suffers with disfiguring scars and functional disorders. There came into play the role of placental gel which is said to improve healing and decrease morbidity[1],which lead us to study the advantages of placental gel dressings over collagen sheets in partial thickness burns.

AIMS AND OBJECTIVE

Aim

The main aim of the study is to compare the efficacy of human placenta extract over collagen sheets in fresh 20 – 40 % burns.

Objectives

1. To decrease the use of analgesics
2. To decrease topical sepsis
3. To reduce tissue oedema
4. To decrease burn extension
5. To decrease the duration of stay in hospital
6. Improve the rate of healing
7. Increase the rate of revascularization
8. To reduce morbidity

HISTORICAL REVIEW

Sushrutha (600 B.C) the father of Plastic Surgery in his "Sushrutha Shamitha", has described accidental burns into frost-bite, heat-stroke, sun -stroke and lightning. He proposed the classification system and according to his view, all thermogenic trauma whether due to extreme weathers, dry or wet, either inert fluid or chemicals produce almost similar damage and hence needs to be treated as single entity the concept which is valid even today.

Fabricius von Hilden, the father of German Surgery wrote in his book "Decombustionibus" the first comprehensive text book for burns management about the aetiology, diagnosis, treatment and complications of burns. He also describes about variety of topical ointments, and surgical procedure like escharotomies, use of splinting devices which are still used today.

A French surgeon Dupuytren, gave that most bizarre treatment methods had been used in the treatment of burns.

The topical therapy in the management of burns wounds has been started by a number of famous scientists, philosophers and physicians who gave burn wound management a varied knowledge.

A number of new advances has been introduced in the treatment of burns by means of topical applications which includes gums, milk, leaves of tea, honey, cork, cow dung, sandalwood, banana leaves, carbolic acid,

linseed oil mixed with lime water, antibiotics impregnated paraffin, cod liver oil and picric acid.

Moore and Underhill introduced the concept of thermal injury induced intravascular fluid deficits in 1930s and 1940s. In 1952 Evans followed with the earliest fluid resuscitation formula. In 20th century, the concept of toxins released systemic derangements in burn patients was described, and hence the ultimate aim of topical therapy is to neutralize these toxins that are absorbed into systemic circulation.

In 1947, researchers found that prompt removal of eschar and immediate wound closure will improve the outcome in burn injuries. It was thought to be not applicable for large burns because of high rates of infection, requirement of large quantity of blood and also the bleeding complications. Some burn units used an excision technique in which a single tangential slice excision was done to remove the superficial layer of second degree burns.

In near future, the new standards of care for burns treatment would potentially be the use of artificial skin substances such as dermal matrices with epidermal components, dermal component matrices, liposomal gene transfer and amniotic wound coverage devices[2].

SKIN

Skin is the largest organ in our body. It consists of many parts of ectodermal tissue. It protects the underlying bones, ligaments and muscles. Every part of our skin consists of hair follicles but some part appears to be devoid of hair. Damaged skin attempts to heal by scar formation which is mostly devoid of colour and pigment.

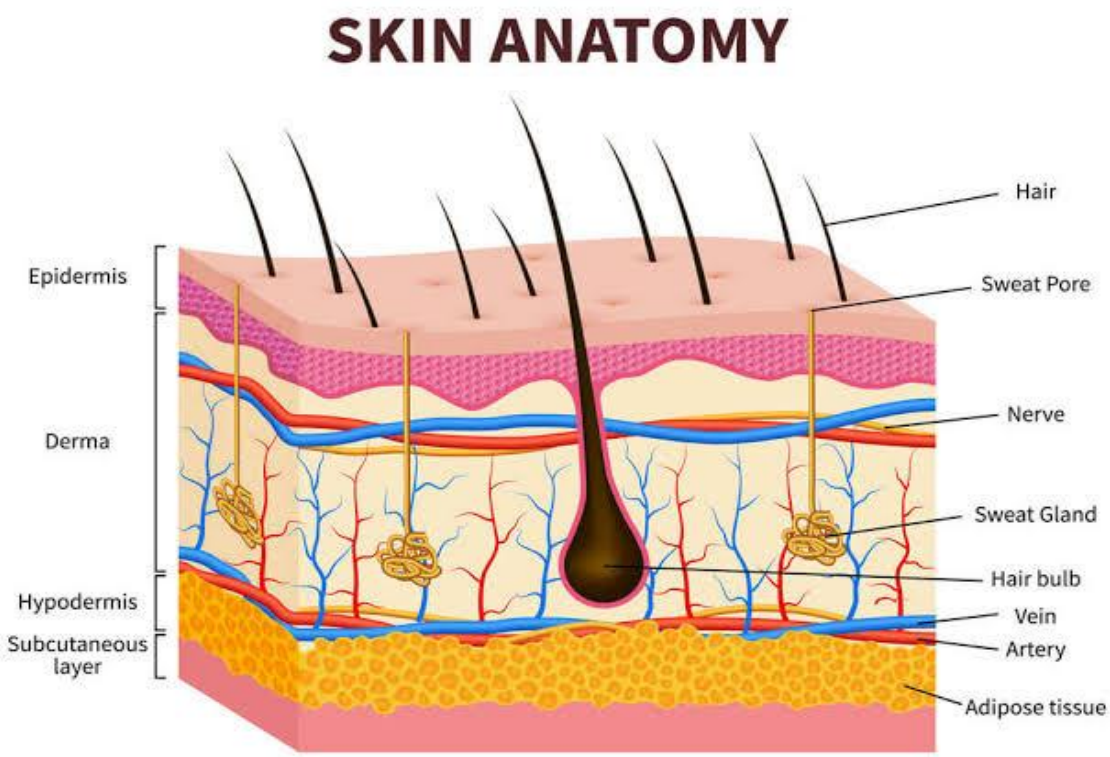


Fig 1: Structure of skin

STRUCTURE

Skin primarily consists of [3]

• Epidermis

• Dermis

• Hypodermis.

Epidermis

Greek word "epi" means "over" or "upon". It is the outermost layer of the skin. It is the protective covering over body surface and an infection barrier. It consists of stratified squamous epithelium with a basal lamina.

It is devoid of vascularity. The deepest layers of cells get nourishment from oxygen diffusion from the surrounding air and by the capillaries in the outer layers of the dermis. Merkel cells, keratinocytes, melanocytes and Langerhans cells are the important cells in epidermis.

The layers of epidermis are stratum corneum, lucidum (only in palms and soles), granulosum, spinosum, basale[4]. Cells are produced by mitosis in the stratum basale. The protein keratin is inserted after the release of cytoplasm. They finally enter the corneum and then desquamate. This phenomenon is called as "keratinization".

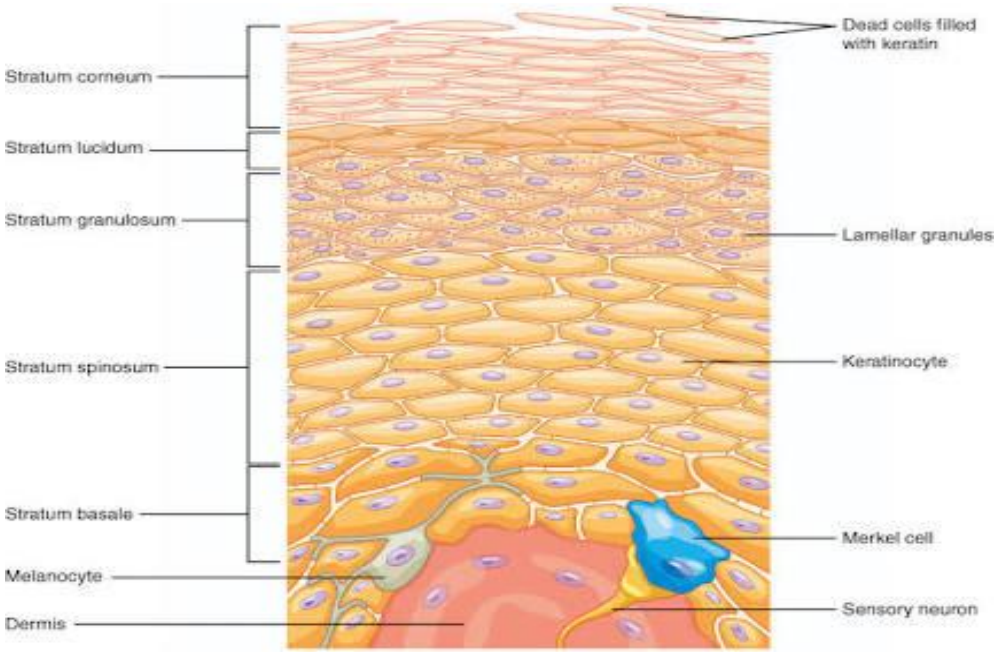


Fig 2: Layers of epidermis

Dermis

The dermis lies under the epidermis. Dermis consists of various nerve endings that provide the sense of touch and temperature. It consists of numerous hair follicles, sweat glands, sebaceous glands which secretes sebum, special apocrine glands, blood vessels and lymphatics. The blood vessels provide nutrition and removes waste in dermis as well as basal layer of epidermis.

The dermis consists of [5]:

Papillary region: superficial layer next to the epidermis

Reticular region: next thicker and deeper layer

Hypodermis

The hypodermis is the part immediately beneath the dermis and is not actually a part of skin. It contains neurovascular bundle and provides attachment to muscles and bone. It is made up of loose connective tissue, elastin and adipose tissue.

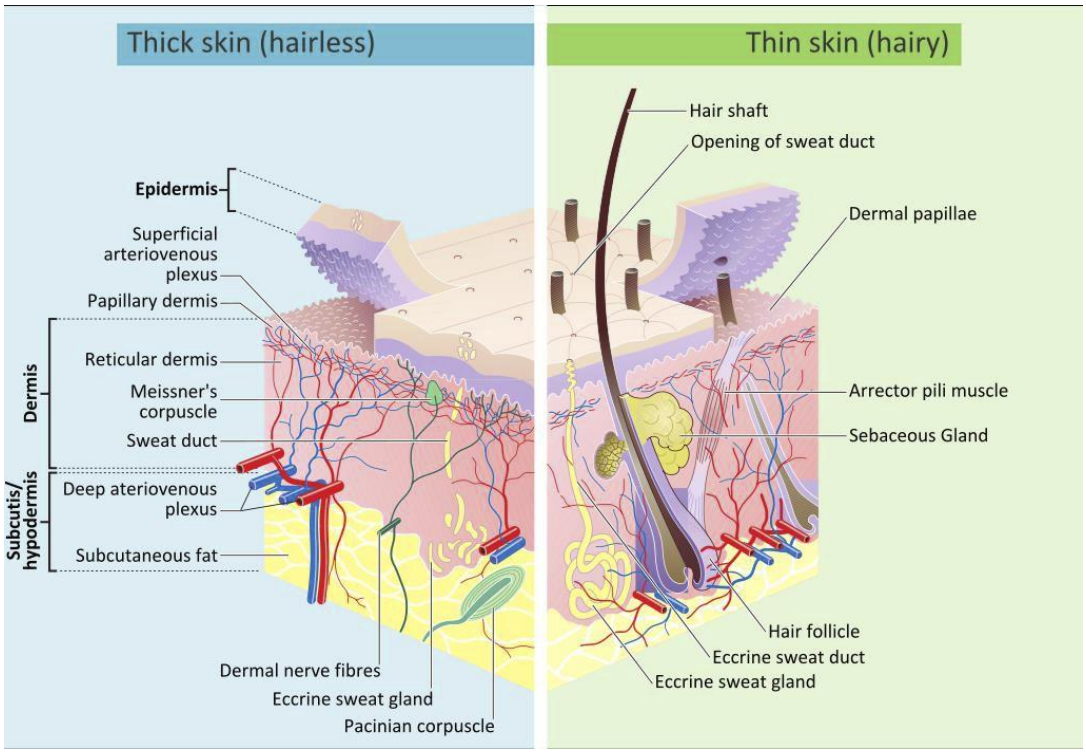


Fig 3: Anatomy of skin

The functions of skin are[6]:

1. **Protection**: skin protects form harmful pathogens and damage by forming an external barrier.

2. **Sensation**: Skin has nerve terminals that respond to temperature, touch, pressure, vibration, and pain.

3. **Thermal regulation**: skin has vicarious vascularity, which permits precise control of heat loss by various methods namely radiation, convection and conduction. It conserves heat by vasoconstriction. It loses heat by vasodilation.

4. **Evaporation control**: Skin acts as a dry and semi-impermeable barrier which conserves fluid loss.

5. Storage Factory: Skin is the reservoir for lipids and water. It is the place where synthesis of vitamin D occurs by action of UV rays on skin.

6. **Excretory function**: It excretes urea through sweat, which is related to thermal regulation.

7. **Absorptive function**: the cells in the outermost 0.25-0.40 mm of the skin are exclusively nourished by environmental oxygen but its contribution to respiration is insignificant. Various medications administered through the skin as ointments, adhesive patch eg. Nicotine patch.

8. **Nutrition conservation**: Skin acts as a resistant barrier that protects wastage of essential nutrients.

BURNS

In Burns wound there is coagulation of proteins in dermal and epidermal parts of tissues or it may be tissue injury by thermal heat or cold application or from absorption by chemical contact. Injury due to burns can be described under the following headings.

Burns Classification[7]

• Burns depth

• Estimation of Burn Size

• Grading of Burn injury

• Response to Burns injury

• Treatment of Burns

1. Burns Classification

o Mechanism of burns injury

o Causes of burns

o Types of burns

❖ Mechanism of injury

Thermal heat injury.

Absorption by chemical contacts.

❖ Causes of burns

Table 1: Causes of Burns[8]

TYPES	CAUSES
Flame	Due to contact with superheated or oxidation of air
Scalds	Due to hot liquids contact
Contact	Due to contact with cold, hot or solid materials
Chemical	Due to contact with noxious chemicals
Electricity	Damage from contact with electrical current through tissues

- Flame Burns

It occurs in closed space. When clothing ignites and contact with skin occurs for a long time results in deep burns. It also causes inhalational injury from superheated oxidized air.

- Scald

Hot liquid causes well defined skin damage and the severity of injury is determined by the duration of its contact with the skin. Common injuries in residential areas are spillage from hot water kettle or cooking

- Spills

It occurs rapidly and cools rapidly so that there is limitation of duration of damage.

- Immersion -

Immersion leads to deeper burns by prolonged steam exposure. Boiling water is particularly dangerous to cause these effect.

- Fat Burns-

The oil which has much higher temperature like Cooking fat ($180^{O}C$) cause fat burns. Hot fat cools slowly on skin causing deep burns.

ELECTRICAL BURNS

Electrical burns cause tissue damage by the passage of electric current through the tissue.

The Quantity of electrical injury depends upon:

1. Resistance capacity of tissue.

2. Total Duration of contact.

3. Square amount of current

Conduction of electric current by bones is poor than that of arterial and venous system, neural tissues and muscles which are all good conductors of electric current. Thereby bones cause more of secondary damage to the surrounding tissue.

Electric current for domestic supply use is 240V, which is a Low voltage current. It leads to cardiorespiratory arrest rather than deeper tissue damage.

High voltage current which is more than 1000V causes injury by following mechanism.

(1) Flash

(2) Current transmission.

a) Flash

They are cutaneous burns caused by arc but it will not produce deeper tissue damage.

b**) Current transmission-**

High voltage electric current transmission will cause deep burns with cutaneous entry and exit wounds. Lightning is a type of high voltage current within short duration. Side strike of current cause superficial entrance burns to the skin and deep exit burn to the foot whereas direct strike of current causes high mortality by sudden cardiorespiratory arrest.

- **Cold Burn**

Cold burns can occur from spillage of nitrogenous liquid material or cooking gas. These leads to either partial or full thickness burns with acute cellular damage. Prolonged exposure to cold will cause frost bite and there is associated ischemic damage. In case of exposure to cold, the warming effect of the circulation is markedly reduced due to vasoconstriction effect. The tissue damage is due to freezing and vasospasm.

- Friction Burn

In this type, tissue damage is caused by combined effects of abrasion and heat.

- Ionizing Radiation

X-Ray irradiation may cause delayed tissue necrosis. One of the long standing cumulative effects of ionizing radiation is risk of development of skin malignancy.

- Chemical Burns

Various chemical materials like acids used in domestic and industrial purpose can cause deeper burns and tissue damage. Tissue damage depends upon the strength and amount of agent and period of contact of agent with the skin. Chemical agents cause coagulation of protein at the exposure site and leads to necrosis of tissue, but systemic effect also occurs on liver and kidney.

- Special situations causing burns

Burns can also be caused by inflammable articles which are used in spray bottles, use of telephones during rains and lightning, the current flow from open wire is also associated with causation of burns. The use of mobile phones in petrol pumps can cause burns due to the explosion of its battery when sparks occur in the exposed petrol or fumes

❖ **TYPES OF BURNS[9]**

Table-2: Types of Burns

Types of Burns	Tissue injury
Scalds	Loss of Partial thickness of skin
Fat burns	Loss Partial thickness of skin
Flame Burns	Damage from superheated oxidized air with patchy partial and full thickness skin loss
Electrical Burns	Loss of full thickness skin with deeper extension
Cold Injury	Ice formation, freezing tissue , vasospasm
Friction	Abrasion and heat
Ionizing Radiation	Necrosis of tissue by radiation and dysplastic changes
Chemical Burns	Inflammation, infection and tissue necrosis with systemic Effects

1.ASSESSMENT OF DEPTH OF BURNS

- ❖ Re-epithelisation can occur from the remaining skin elements.

- ❖ It provides capacity of elastic property of skin whish useful in circumferential burns.

The Depth of burn injury[10] based on

a. Temperature of the burning agent.

b. The way of thermal energy transmission

c. The contact duration

Fabry proposed the first classification of intensity of into intensity three degrees

- ➢ Reddening of skin and blister formation
- ➢ Devastation of skin
- ➢ Eschar formation along with charring

Another classification system was developed by Jackson[11]. Burns divided into two degrees

- ➢ Partial thickness loss of skin -
- ➢ Full thickness loss of skin - complete loss of all the layers of skin, in which healing occurs by contraction of wound edges.

Punch biopsy gives definitive diagnosis of depth of burn injury. Laser Doppler is useful to assess the circulatory system in deeper burns.

The various classification systems were used to provide the following degrees of burn injuries into;

• First degree

• Second degree

Superficial partial thickness

Deep partial thickness

• Third degree - full-thickness

• Fourth degree

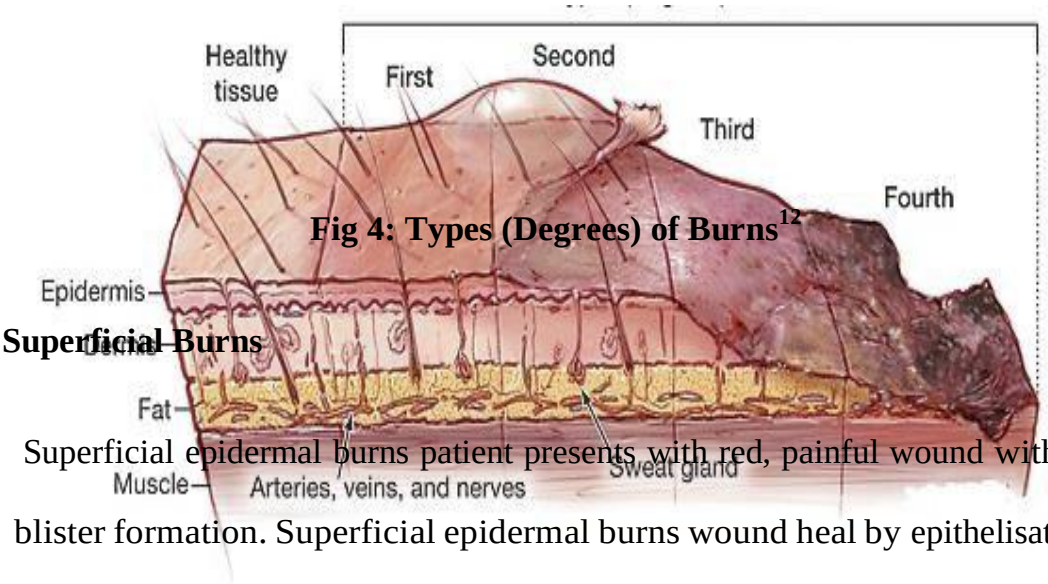


Fig 4: Types (Degrees) of Burns[12]

Superficial Burns

Superficial epidermal burns patient presents with red, painful wound without blister formation. Superficial epidermal burns wound heal by epithelisation.

Superficial dermal burns patients presented with blistered, painful wound which heals by epithelisation without scarring.

❖ Deep Burns

All the skin adnexal structures will be lost and burns wound heal by secondary intention with scar formation.

❖ Deep dermal burn

In which blisters are seen with patchy areas of redness with no capillary refilling on deep pressure and loss of neural sensation.

❖ Full thickness burn

Presents with eschar and it is associated with absent sensation.

Table 3: Depth of burns[13]

Current	Doctrinal Nomenclature	Extent of skin involvement	Clinical features
Superficial thickness	1st degree	Involvement of Epidermis only	Erythema, Less pain
Superficial Partial	Second- degree	Till Superficial (papillary) dermis	Blisters with clear fluid, and mild pain
Deep Partial thickness-	Second –degree	Till Deep (reticular) dermis	White skin appearance, with
Full thickness Burns	Third- or fourth-Degree	Below the level of Dermis and	Hard, leather-like eschar,

Fig 5: Partial thickness burns

Fig 6: Deeper partial thickness burns

Fig 7: Full thickness burns

Fig 8: Mixed partial and full thickness burns

ESTIMATION OF BURN SIZE

The burn size estimation is required to calculate the amount of fluid required for resuscitation.

• Rule of palm

• The Wallace rule of nine

• Lund and Browder chart

- Rule of palm[14]:

Small area of burns involvement can be calculated with the help of Rule of palms. Palmar surface of hand of the patients corresponds to roughly one percentage of body surface area.

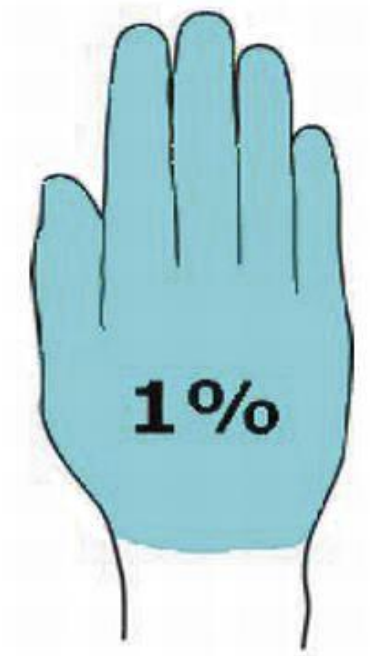


Fig 9: Rule of palm

Victims palm and finger surface is equal to 1% of body surface

- The Wallace and Berkow rule[15] :

Rule of nine assess the percentage of burns. It is useful for calculating fluid replacement. The percentage of the body surface area involved in burns can be calculated as follows.

- Head= 9%
- Chest= 9%
- Abdomen (front)= 9%
- Upper/mid/low back and buttocks=18%
- Each arm=9%
- Genitalia=1%
- Each lower limb=18% total (front=9%, back=9%)

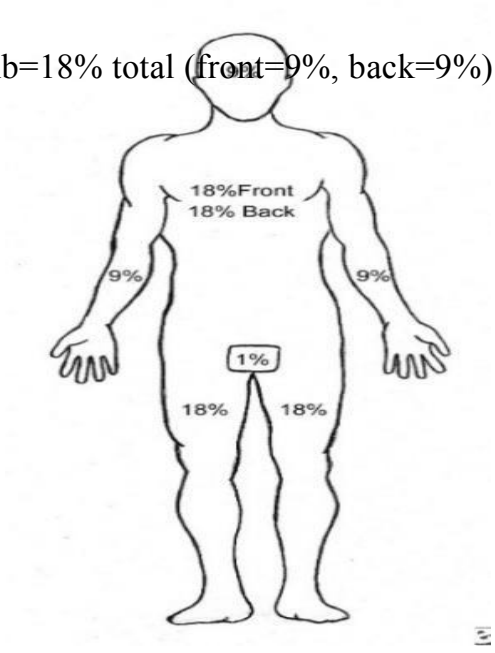
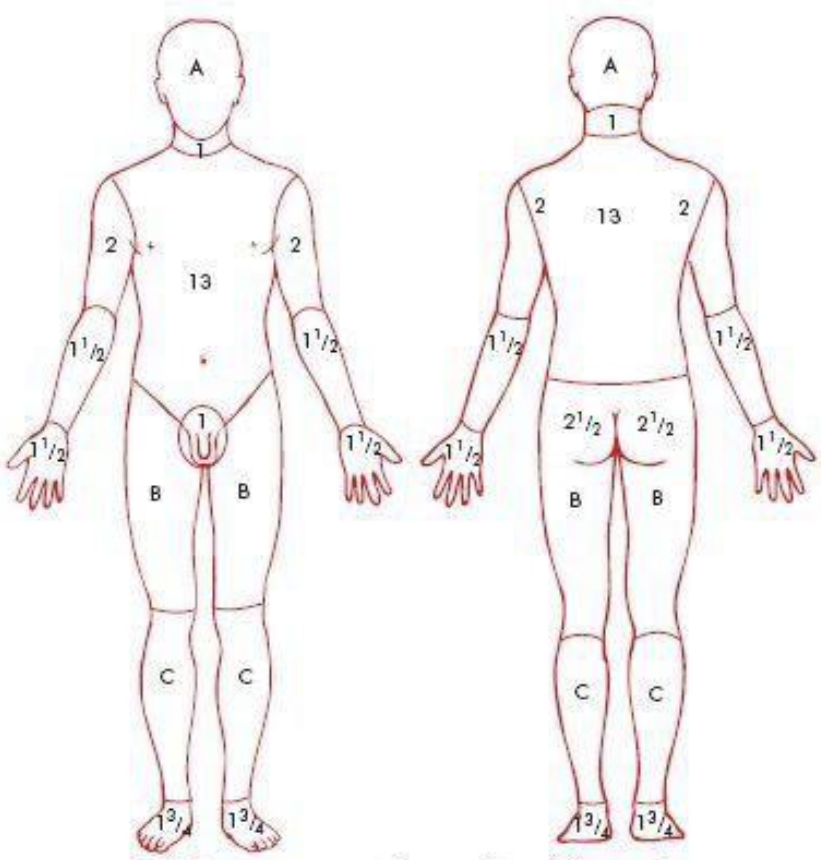


Fig 10: Wallace and Berkow rule

Lund and Browder[16]

Lund and Browder was the first one to consider age as a factor for calculating percentage of the burns because body surface area for head is progressively decreased compared to extremities as the child becomes older. The Lund and Browder Chart is more useful in calculating percentage of paediatric burns.



Relative percentage of area affected by growth

Age in years	0	1	5	10	15	Adult
A Head	9	8	6	5	4	3
B Thigh	2	3	4	4	4	4
C leg	2	2	3	3	3	3

Fig 11: Lund and Browder Burn Chart

Table 4 : Berkow formula to estimate Burn size[17]

	Age in Years					
	0-1	1 to4	5 to 9	**10 to 14**	**15--18**	Adult
Body part	**Percentage of Burn size**					
Head	19	17	13	11	9	7
Neck	2	2	2	2	2	3
Anterior surface	13	13	13	13	13	13
Posterior surface	13	13	13	13	13	13
Left side Buttock	2.5	2.5	2.5	2.5	2.5	2.5
Right side	2.5	2.5	2.5	2.5	2.5	2.5
Genitals	1	1	1	1	1	1
Right Upper arm	4	4	4	4	4	4
Left Upper Arm	4	4	4	4	4	4
Right Lower	3	3	3	3	3	3
Left Lower Arm	3	3	3	3	3	3
Right Hand	2.5	2.5	2.5	2.5	2.5	2.5
Left Hand	2.5	2.5	2.5	2.5	2.5	2.5
Right Thigh	5.5	6.5	8	8.5	9	9.5
Left Thigh	5.5	6.5	8	8.5	9	9.5
Right Lower Leg	5	5	5.5	6	6.5	7
Left Lower Leg	5	5	5.5	6	6.5	7
Right Foot	3.5	3.5	3.5	3.5	3.5	3.5
Left Foot	3.5	3.5	3.5	3.5	3.5	3.5

2. Grading of Burn Injury

TABLE 5: Grading of burns[18]

Burn	Children	Adults	Elderly
Minor degree burns	Lees than10% TBSA	Less than15percentage TBSA	Less than10 Percentage TBSA
	Full-thickness less than 2% TBSA	Full-thickness Less than2% TBSA	Full-thickness Less than 2% TBSA
Moderate degree burns	From 10-20% TBSA	From 15-25% TBSA	From 10-20% TBSA
	Full-thickness less than10% TBSA(non-critical areas)	Full-thickness less than 10% TBSA(non-critical areas)	Full-thickness less than10% TBSA(non-critical areas)
Severe degree burns	More than 20%TBSA	More than25%TBSA	More than20%TBSA
	Full-thickness more than10% TBSA	Full-thickness more than 10% TBSA	Full-thickness more than 10% TBSA
	Burns in the Critical areas*	Burns in the Critical areas*	Burns in the Critical areas*
	Complicated burns**	Complicated burns**	

* In our body there are some critical areas include such as face, distal extremities and perineum

** Complicated burn injury includes inhalation injury, high-voltage electrical current burns, associated major trauma, infants, elderly, and comorbid medical problems (e.g., diabetes mellitus, immunocompromised).

Severity of burn injury depends on

➢ Contributions of Etiologic agents

➢ Age of patient

➢ Extent, depth, and location of burn injury

➢ Presence of inhalational burn injury

➢ Associated comorbid illness.

The American Burns Association had established guidelines for the classification of burn severity into major, moderate, minor and devised appropriate and optimal treatment for each category.

Major burns injury

➢ Partial thickness burns of 20% BSA in children younger than 10 years or greater than 25% of BSA in adults.

➢ Full thickness burns of more than 10% BSA in elderly, burns in critical areas like face, eyes, ears, hands, feetor perineum that causes functional or cosmetic impairment.

- ➢ Chemical agent causing burns injury
- ➢ High-voltage electrical injury or burns causing halation injury.
- ➢ Burns in High-risk patients (immunodeficient, diabetic)

These major burn injuries are managed by trained professionals and require management in intensive care units.

Moderate burns injury:

➢ Partial-thickness burns of 10-20% of BSA in children and 15-25% of TBSA in adults

➢ Full-thickness burns 2-10% of TBSA with no functional or cosmetic impairment to critical areas.

These burn injuries are hospitalized for their initial care and discharged after stabilisation and wound management

Minor burns Injury

➢ Burns of less than10% of BSA in children or less 15% of BSA in adults and elderly.

➢ Full-thickness burns less than 2% of TBSA with no functional or cosmetic impairment to critical areas of the body as mentioned earlier. This type of burn injuries are managed safely in the outpatient setting.

ABA has stated that the below mentioned burn injuries need definitive care at burns unit attached hospital after initial resuscitation at casualty.

- Both partial and full thickness burns more than 10% BSA in patients age less than 10 or more than 50 years of age.
- Partial and full thickness burns more than 20% of BSA in the remaining age groups.
- Burns involving the critical areas of body and major joints
- Chemical burns
- Electrical burns
- Inhalational burns.

Burn injury in patients with co morbidities which will delay the recovery Period and leads to increase the morbidity and mortality.

Effects of Burn Injury[19]

Classified as-

➢ Local

➢ Regional

➢ Systemic Local Effects

Cell necrosis caused by tissue heat

Damage to the peripheral microcirculation

Thrombosis in the capillaries

Increased capillary permeability

Leakage of serous fluid externally and tissue oedema

The skin provides an effective barrier to the transfer of energy to the deeper tissues, but however even after the initiating focus is removed; the response of local tissues can cause an injury to the deeper tissue layers.

Jackson describes that presence of different regions/zones of a burn wound[20].

These zones are 3 dimensional, and tissue loss in the region of stasis will cause deepening of the wound and wound widening, adequate resuscitation changes zone of stasis to a healing zone by reducing the hypoperfusion

The Jacksons three zones of a burn are:

Zone of coagulation - It happens only maximum damage to tissue. Coagulation of contained proteins will lead to irreversible tissue loss occurs.

Zone of stasis- In this there is tissue perfusion is markedly reduced .It is an area in which tissue injury can be reversed if adequate resuscitation is done at the right time. Management here is aim to increase tissue perfusion and protect the tissue from any irreversible damage. Complete tissue loss from prolonged tissue hypoperfusion, inflammation and infection and tissue swelling which is manifested as oedema can occur in this region.

Zone of hyperaemia - Tissue perfusion is increased in this area. The cells in this zone usually recovers unless there is associated septicaemia or increased period of decreased tissue perfusion

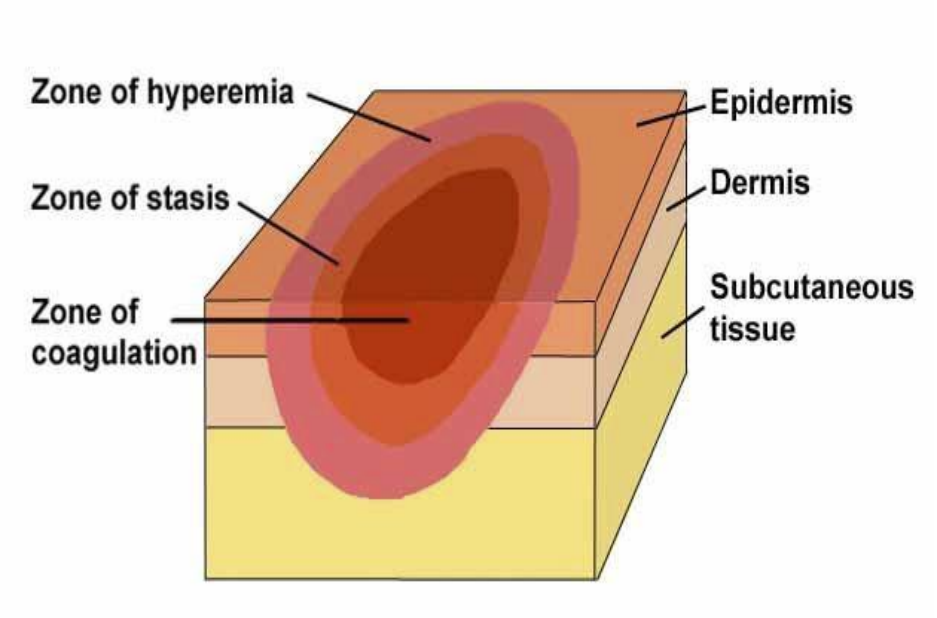


Fig 12: Zones in burn by Jackson

➢ Inflammation -Response to inflammation happens immediately.

The area of least damage to the skin is manifested as erythema which leads to increased vasoactivity. Small areas of erythema disappear after some time. Prolonged inflammatory response is produced by severely damaged tissues which release cytokines and inflammatory mediators.

Desloughing[21] -separation of damaged tissue completes by 3 weeks.

➢ Infection - The main source of infection is the damaged dead tissues. Infection starts within 24 to 48 hours, which then goes for bacteremia and Septicaemia. Septicaemia is the most common cause of death in patients after the first 24 hours.

SYSTEMIC EFFECT

Fluid loss:

Tissue damage releases cytokines which affects the microcirculation causing third space loss in peripheries and internal body cavities causing hypotension. Hence fluid resuscitation is necessary to prevent death especially in the first day of burns.

Multi organ failure[22]:

Massive fluid loss, toxaemia and profound infection induces stress response and results in MODS and SIRS eventually death.

Inhalational injury:

Burns in closed spaces causes release of toxic gases and affects the upper airway and produces symptoms like stridor, cough, hoarseness of voice, and finally respiratory distress and death.

Systemic complication:

- Upper GI bleed from curling ulcers, Deep Vein Thrombosis and pulmonary thromboembolism

MANAGEMENT OF BURNS

First aid:

- Stop the source of burns to prevent further injury.
- Cool the burn area by using water at a temperature 15 degree Centigrade for at least twenty minutes. The affected patient is then wrapped with sterile linen and transported to a health care centre.

First degree burns:

- The affected area is cooled and covered with cold compression bandage
- Medications to treat infection and pain

Second degree burns:

- Don't attempt to break the blisters and clothes adherent to skin.
- Wash in running cool water for 20 minutes.
- Elevation of affected extremities
- Medications for infections and pain
- Patients with burns in critical areas like face, neck, eye involvement need immediate emergency measures and hence referred to tertiary care centre with attached burn unit

Third degree burns:

- Assess for airway, breathing and circulation
- Do not attempt to remove the stuck cloth materials
- Affected burnt area cooled by running water
- Elevation of affected extremities
- Roll the affected area with clean sterile bandage

Emergency treatment:

Primary survey:

➢ Airway

➢ Breathing

➢ Circulation

➢ Disability

➢ Exposure and environmental control

➢ Fluid resuscitation

In case of severe facial burns, patient may need immediate endotracheal intubation / emergency tracheostomy

Early eschar removal is considered for circumferential burns involving chest and neck to avoid respiratory compromise[23].

Primary survey:

It is based on protocol formed by modified Advanced Trauma Life Support.

- Airway:

Assess for airway compromise due to vocal cord edema.

- Breathing:

Patient with all type of burns need 100% oxygen through non rebreathing mask. Restriction of ventilation occurs due to full thickness circumferential burns involving neck and chest and leads to respiratory failure. Hence should be treated by early escharotomies.

- Circulation:

Access to intravenous lines is mandatory to correct fluid loss.

- Disability :

Level of consciousness is assessed by using Glasgow coma scale

- Exposure with environmental control:

Patient should be examined from head to foot and also asked for presence of any comorbid conditions which worsens the disease.

- Fluid resuscitation

Fluid requirement is calculated based on body surface area involved by burns.

Urine output monitoring by urinary catheterisation is mandatory and also useful to assess the abdominal compartment syndrome. In children it is mandatory to assess the hydration status because they are prone to develop hypothermia

Fluid resuscitation formulas

1. Parkland Formula[24]

It is the commonly used formula.

FLUID REQUIREMENT = 4ml X percentage of burns X body weight in kg

Maximum percentage is 50%

Half of the calculated volume of fluid should be given in first 8 hours from the time of initial injury. Next half is given within next 16 hours

2. Evans formula - based on body surface area

In first 24 hours

Normal saline 1 ml /kg per percentage of burns

Colloid at 1 ml / kg per percentage of burns

In adults 2000 ml of 5% Dextrose in water

In second 24 hours, 50% of first 24 hour volume

3. Modified Brooke formula[25]

In first 24 hours:

Ringer lactate: 3 ml / kg per percentage of burns

Half of the calculated volume of fluid should be given in first 8 hours from the time of initial injury

Usually colloids not given in first 24 hours

Next 24 hours:

Crystalloids are given to maintain the output of urine

Colloid 0.3 to0.5 per kg per percentage of burns

4. Galveston formula

Used in paediatric patients. 5000ml/m^2burnt area + 1500 ml / m^2 total area

5. Slater Formula

Ringer lactate at 2 litres per 24 hours + fresh frozen plasma at 75 ml/kg /24 hours.

6. Ideal formula

2-4 ml of ringer lactate / kg body weight / percentage of burns

Maintenance of urine output 0.5 to 1 ml /kg/hour

Resuscitation

The ultimate aim of resuscitation is to correct the fluid loss in order to maintain adequate tissue perfusion and to preserve the vital organ

function. Delays in resuscitation must be minimized. The adequate resuscitation is achieved by establishment and maintenance of reliable intravenous access. Adequacy of resuscitation is assessed by monitoring the blood pressure, pulse rate and urine output.

Secondary survey

It should be started at the end of the primary survey and after commencement of emergency treatment.

• Obtain a medical history

• Head to foot thorough examination for any associated morbid injuries.

• Recording a detailed burn diagram

• Analgesics and sedatives

• Tetanus prophylaxis

• Transfer to burn unit when indicated

• Psychiatric counselling

BURN WOUND MANAGEMENT

- Dressing[26]

In 1925 Davidson used Tannic acid spray to reduce pain and produce a clean wound bed. Previously it was thought that Gentamycin sulfate was used in a strength of 0.1% topical cream for burn wound dressing, which was intended for its anti pseudomonal coverage but was withheld due to its ototoxicity and nephrotoxicity.

A Sulfa derivative Silver sulfadiazine, an antibacterial was used as a topical burn cream on second- and third-degree burns. It has broad-spectrum antibacterial activity and fewer complications.

Furacin or nitrofurazone cream applied topically is indicated in third degree burns and it is useful against some gram positive organisms like staphylococcus aureus, but its prolonged use promotes fungal colonization.

- Escharotomy[27]

Extremities should be elevated in all cases of burns. It should be kept in reverse trendelenberg position. Patient should perform physiotherapy frequently to minimise tissue oedema. The eschar separates from the underlying tissue by subeschar infection.

Circumferential eschar with presence of one of the following warrants for emergency escharotomy

- ➢ Partial or fully established ischemic change in extremities and digits due to vascular compromise .
- ➢ Respiratory insufficiency due to circumferential burns involving chest, neck, and abdomen.

Neurovascular integrity is monitored frequently. Capillary refilling time, Doppler signals, pulse oximetry and sensation distal to the burned area is to be checked every hour. Compartment pressures of the limb should be checked initially to establish a baseline and subsequently any increase in capillary refill time, decrease in Doppler signal or change in sensation. Compartment pressures more than 30 mm Hg should be treated by immediate decompression by either escharotomy/ fasciotomy.

FIG 13: FASCIOTOMY

Skin grafting in burns[28]:

Skin grafting in burns is not a new concept. In 1869, Reverdin applied small grafts to ulcers in old burns. Carl Thiersch Agerman described the technique of skin grafting by excising long and thin slices of skin with dermis using a straight razor and spreading to a newly debrided granulation tissue bed as early as 1886. Since then various types of grafts like the pinch graft, sandwich graft etc. have been used. Both allograft and Xenografts have been used in burn treatment.

In the beginning, graft was taken free hand using long and thin bladed knife. Finochietto controlled the depth of skin harvest by developing an improved knife in 1920. Watson, Braithwaite, Goullian and Humby have designed various knives used to remove burned tissues and harvest skin grafts

The concept of "meshing" the skin graft allows it to cover a wide area. German surgeon Lanz made a hand held device for meshing and this was then altered by the double roller graft mesher developed by Vandeput and Tanner. Now electrical dermatomes are used to take graft from any desired site in body and meshing it.

Fig 14: Skin grafting

Burned tissue sloughs off by a process of auto digestion, then sub-eschar infection and bacterial digestion leads to separation of dead tissue and nearby viable tissue. Subsequently skin graft is applied to the granulating wound bed. Zora Janzekovic of Czechoslovakia introduced the concept of early burn excision and immediate skin grafting. Tangential excision is slicing of thin and parallel layers of the burn until healthy tissue appears.

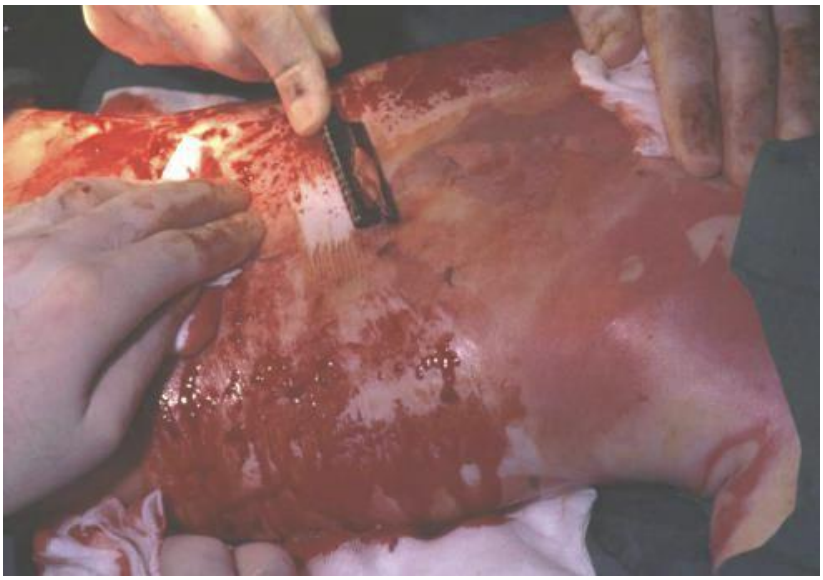


Fig 15: Tangential Excision

Ideal skin replacement products should be easily available, easy to use, infection resistant, have minimal side effects, good cosmetic effect and cheap.

Skin substitute are either temporary or permanent. Temporary skin substitutes include topically applied agents that have biologically active substances and those which fasten wound healing.

In 1980s, Burke et al developed a "skin substitute" Integra[29]. The United States FDA approved Integra for use in burns treatment in 1996. Integra is a two layered skin substitute with an outer layer of silicone, over an inner layer of bioengineered collagen matrix. It is described as "dermal regeneration template" which allows the ingrowth of fibroblasts, vascular tissues and cells in a uniform way. In due course, bovine collagen gets replaced by patients collagen, the reformed "neodermis" nearly matches normal dermis.

The dermal replacement product Alloderm consists of specially treated cadaver skin. An acellular, nonantigenic dermal matrix is left behind after removal of epidermis and antigenic dermal cells. The patient's epidermal cell is another semipermanent skin substitute that is grown in tissue cultures which is also tried.

➢ The Collagens

The collagens are a family of closely related proteins that have common properties. The third of their amino acid sequence is glycine and are rich in serine, proline, threonine, and alanine. There are six types of collagens. Collagen I, II, III are rich in alanine, contain fewer hydroxylated residues than other collagen types and are resistant to nonspecific proteases. Commercially available collagens are preserved in aseptic medium after gamma sterilisation.

Collagen Dressing

It is used in first and superficial second degrees burns. It forms a coating over the wound and aid in the process of healing. Collagen is present in every part of the body as a structural protein and connective tissue is the place of its abundance. It creates physiological interface between the environment and wound surface and prevents the entry of microorganism like bacteria.

The advantages of collagen dressing are absorption of exudative fluid and it forms a barrier for external sources of infection by creating a wet wound bed. It helps in angiogenesis. It decreases oedema in the burns area and enhances the metabolic activity of the granulation tissue.

The main advantages of collagen is it is natural, not immunogenic, not pyrogenic, does not cause allergy, achieves hemostasis and it is pain less.

Collagen Sheet and Application

After application

Fig 16: Collagen Application

PLACENTAL EXTRACT GEL[30]

It consists of nitrogen and human placental extract. It is used to heal chronic wounds that aren't healing, induce repigmentation in vitiligo and inflammation of placenta. It is available as a gel for topical application. Placenta contains large amount of vitamins, minerals, peptides, amino acids, nucleic acid and hyaluronic acid.

It belongs to human derived ingredients. It works by increasing the blood flow and certain levels of proteins by promoting tissue regeneration and allows wound healing with minimal scar.

Benefits:

- It has excellent healing property. It reduces small scars and non healing wounds
- Gradually slows the ageing process, smoothens and prevent wrinkles on the face and fine lines around the eyes and stimulates the production of new cells.
- Reduces excess oil from the skin and normalises the activity of facial sebaceous glands
- Hypoallergenic, well tolerated and don't have any known side effects.
- Keep the skin hydrated and fresh

How to use:

- Clean the affected area properly before applying the gel
- Wash the hands before and after applying the gel
- Don’t cover the affected area with bandage
- Use a thin layer of the gel to avoid skin peeling.
- Avoid direct contact with eyes, nose and mouth.

Side effects:

No documented side effects till date. Should look for wetness and soddening of skin

MATERIALS AND METHODS

A prospective study was done at Coimbatore Medical College Hospital between January 2018 to December 2018 in which 100 patients who presented with partial thickness burns (< 40%TBSA) were chosen for the study by Random Sampling Technique.

Sample size:

The size of the sample is100 cases

50 cases with placental gel dressing group

50 cases with Collagen dressing group

Inclusion criteria:

- Partial thickness burns
- Fresh burns presenting within 24 hours
- Age < 50 years
- Non infected burns
- Less than 40 % of body surface area involvement

Exclusion criteria:

- Full thickness burns

- Burns presenting after 24 hours
- Age > 50 years
- More than 50 % body surface area involvement
- Grossly infected burns wound at presentation
- Patients treated and referred from outside
- Patients with systemic illness
- Patients not willing to give consent

MATERIALS USED

1. Placental extract gel.

2. Collagen sheets (contains sterile reconstituted type-1 collagen sheet)

3. Dressings with cotton pads and roller gauze.

Directions of use:

Prior to applying placental gel the site was thoroughly cleansed with povidone iodine or any other antiseptic solution. The placental gel is then applied over the cleaned wound. Repeated dressing is not necessary, unless the wound becomes infected. The wound should be watched for any discharge/infection.

Technique of application:-

Group 1 (placental extract gel):

Thorough wash of the burn wound was done using Normal saline. Placental extract gel was applied over the cleaned wound and occlusive dressing was applied with gauze-pad and roller bandage. The patients were asked to take bath with soap daily and the dressings were changed along with the application of placental gel.

Group 2(Collagen dressing):

Thorough wash of the burn wound done using Normal saline. Then the collagen sheet soaked in normal saline is directly applied over the burn wound and gently spread over the wound. The collagen dressing is allowed to dry. The collagen gets adherent to the skin wound in few hours. The patient was asked not to move till the collagen dries off.

The collagen dressing was allowed to peel off on its own. Antibiotics were prescribed to the patients according to the antibiotic schedule of our hospital.

Patients were followed up on days 1, 2, 7, 14, and 28 or for more days in event of any adverse effects related to medication or aggravation symptoms or complications.

Patients were discharged once complete epithelialisation occurred. Time taken for complete epithelialisation in both the group was noted.

Patients were advised to review after a month in order to assess and manage any late complications like hypertrophied scar, contractures and keloids.

Data Collection:-

During the period of study data were collected regarding the following characteristics

- Age of the patient
- Cause of burns
- Type of burns
- Degree and percentage of burns
- Grading of Burns
- Treatment given
- Time taken for wound healing.
- Duration of hospitalization
- Texture of healed area
- Contour of healed area

Statistical analysis

The statistical analysis was done using Mann Whitney test, chi square test, Fishers exact test and the analysis interpreted by the p value and Z value P value of less than 0.05 was considered statistically significant.

IMAGE GALLERY

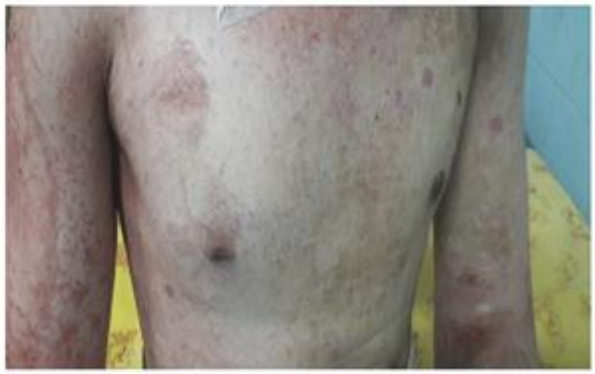
FIG 17: PLACENTAL GEL EXTRACT

FIG 18:COLLAGEN SHEETS

Fig 19: PLACENTAL GEL APPLICATION AND FOLLOWUP

Day 0
Burn surface

After cleaning



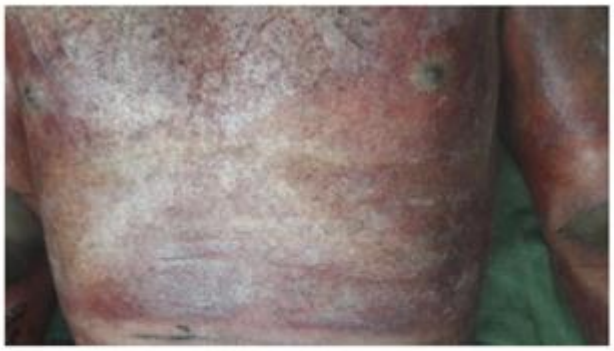
After 7th day

After 28 th day

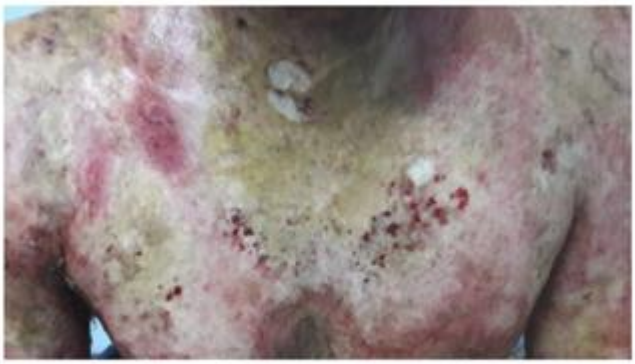
FIG 20: COLLAGEN APPLICATION AND FOLLOW UP

Initial burns

Collagen application



After 7 days



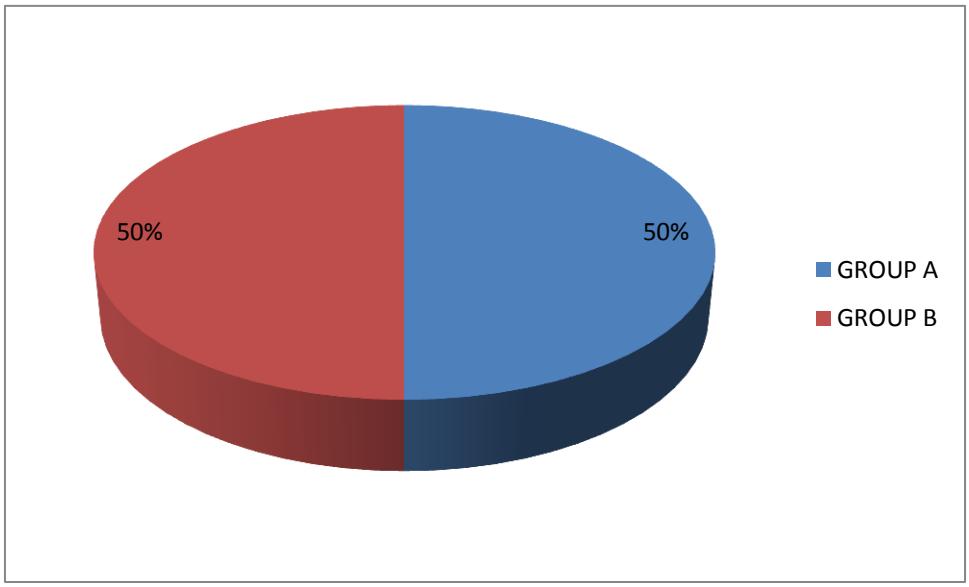
After 14 days

STATISTICAL ANALYSIS

STATISTICAL RESULTS

TABLE 1

GROUP	NUMBER	PERCENTAGE
GROUP A	50	50.0
GROUP B	50	50.0
TOTAL	100	100.0



Equal number of patients have been included in both the groups.

Hence the data is comparable

TABLE 2

AGE DISTRIBUTION

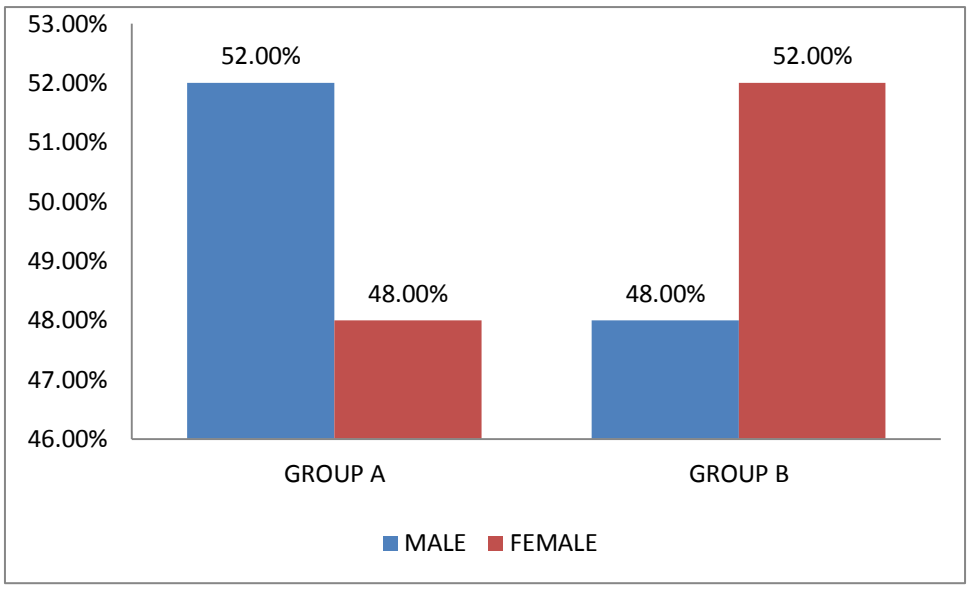
	GROUP A		GROUP B	
AGE	Mean	Standard Deviation	Mean	Standard Deviation
	35.26	9.927	38.06	10.504

The average age in our study was 35 years in placental extract group and 38 years in collagen sheets group. There is no significant difference in the age distribution, hence the data is comparable

TABLE 3

SEX DISTRIBUTION

GENDER	GROUP A		GROUP B	
	NO	%	NO	%
MALE	26	52.0%	24	48.0%
FEMALE	24	48.0%	26	52.0%
Total	50	100.0%	50	100.0%

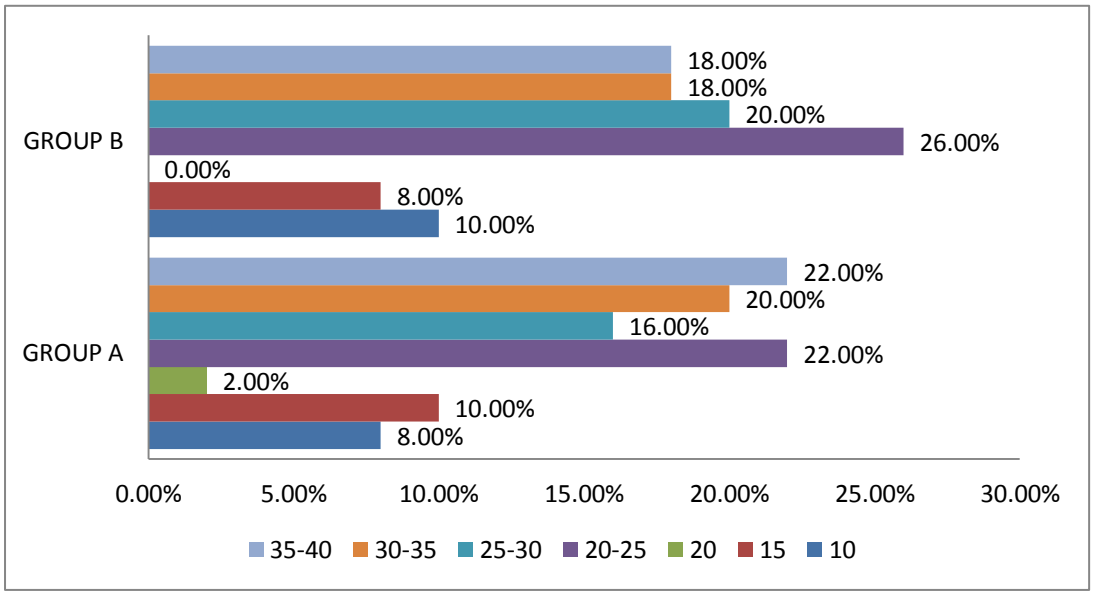


Male to female ratio was similar in both groups. Hence the data is comparable between the two groups

TABLE 4

PERCENTAGE OF BURNS

PERCENTAGE OF BURNS	GROUP A		GROUP B	
	NO	%	NO	%
10	4	8.0%	5	10.0%
15	5	10.0%	4	8.0%
20	1	2.0%	0	.0%
20-25	11	22.0%	13	26.0%
25-30	8	16.0%	10	20.0%
30-35	10	20.0%	9	18.0%
35-40	11	22.0%	9	18.0%
Total	50	100.0%	50	100.0%



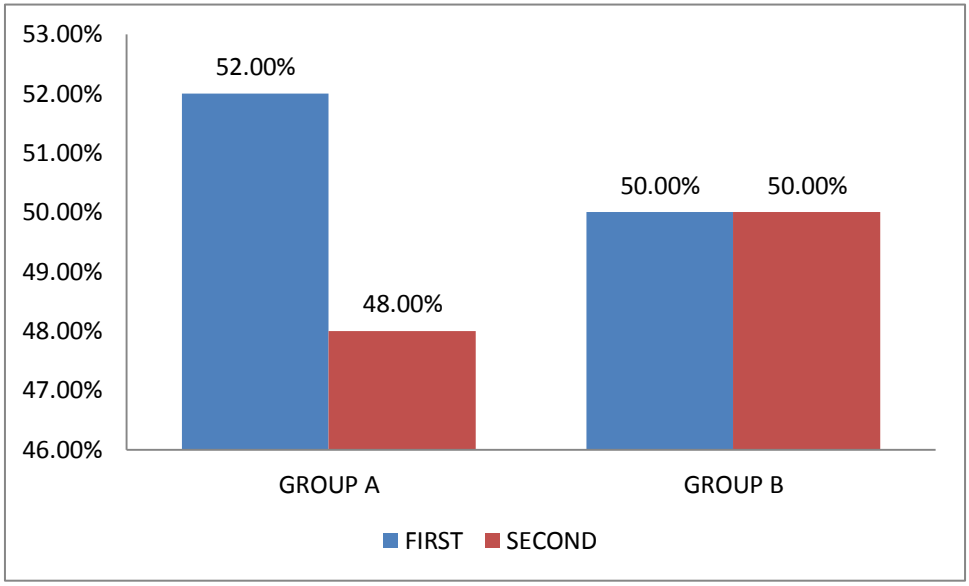
CHI-SQUARE TEST P VALUE =0.932(p>0.05)

There is no significant difference between the two groups, hence the data is comparable.

Table 5

DEGREE OF BURNS

DEGREE OF BURNS	GROUP A		GROUP B	
	NO	%	NO	%
FIRST	26	52.0%	25	50.0%
SECOND	24	48.0%	25	50.0%
Total	50	100.0%	50	100.0%



CHI-SQUARE TEST P VALUE =0.841(p>0.05)

There is no stastistical significance between the two groups, as both groups contain equal number of patients with first and second degree burns

TABLE 6

SCAR COLOUR

CHI-SQUARE TEST P VALUE <0.001(p<0.05)

Only 2% of individuals in group A had obvious mismatch, while 60% of patients had a perfect Scar colour. Since the p value is 0.001, the data is statistically significant and proves the superiority of placental gel over collagen in terms of scar colour

SCAR COLOUR	GROUP A		GROUP B	
	NO	%	NO	%
GROSS	2	4.0%	10	20.0%
OBVIOUS	6	12.0%	18	36.0%
PERFECT	30	60.0%	7	14.0%
SLIGHT MISMATCH	12	24.0%	15	30.0%
Total	50	100.0%	50	100.0%

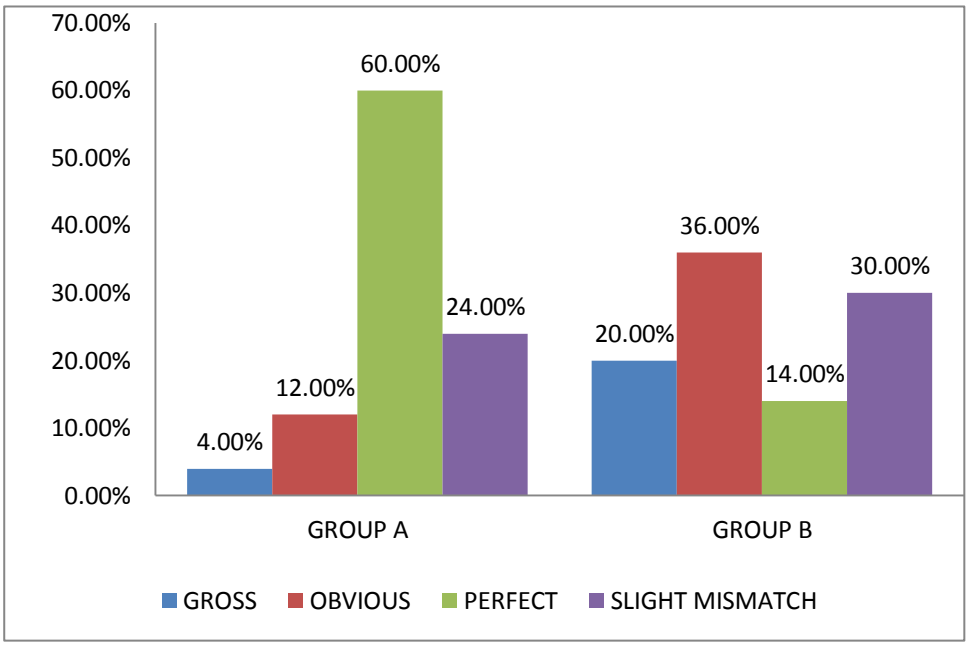
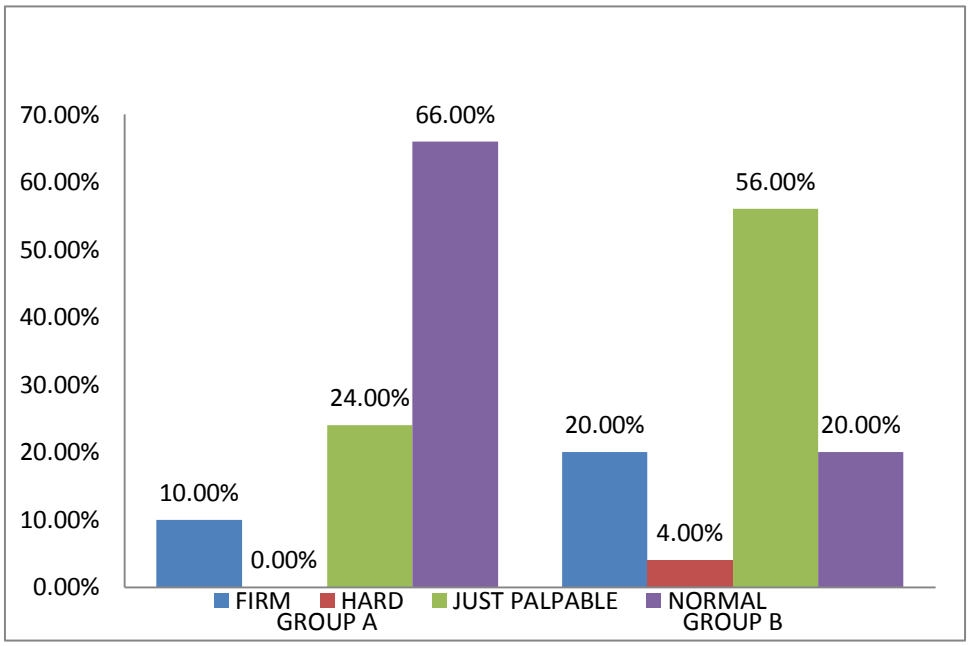


TABLE 7

SCAR TEXTURE

	GROUP A	GROUP B

SCAR TEXTURE	NO	%	NO	%
FIRM	5	10.0%	10	20.0%
HARD	0	.0%	2	4.0%
JUST PALPABLE	12	24.0%	28	56.0%
NORMAL	33	66.0%	10	20.0%
Total	50	100.0%	50	100.0%



CHI-SQUARE TEST P VALUE <0.001 (p<0.05)

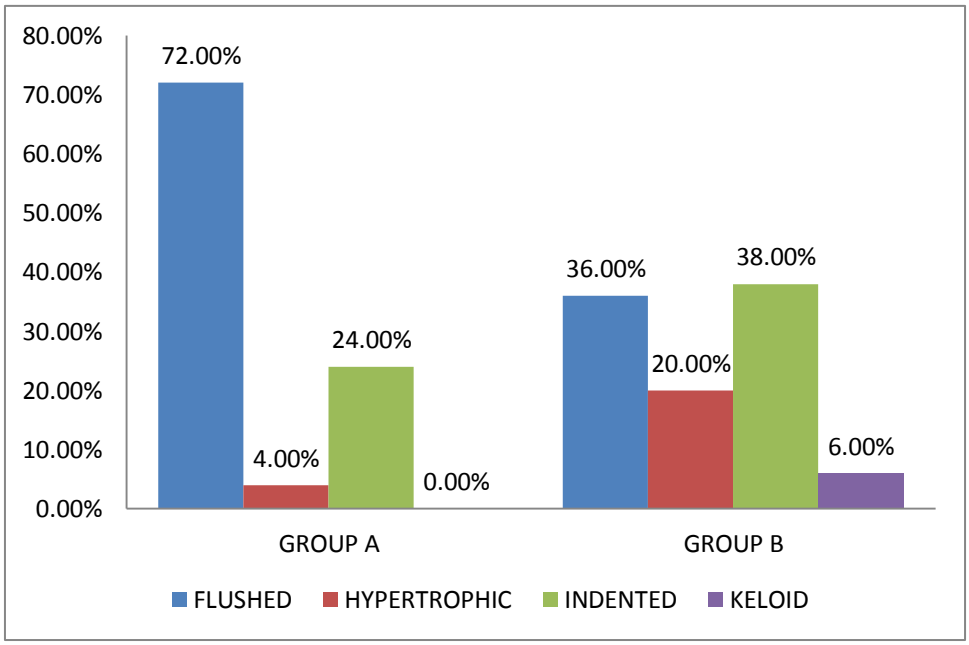
66% of individuals had normal scar texture in group A, while only 20% in group B had normal scar texture.

P value <0.001 shows significant statistical difference

TABLE 8

SCAR CONTOUR

SCAR CONTOUR	GROUP A		GROUP B	
	NO	%	NO	%
FLUSHED	36	72.0%	18	36.0%
HYPERTROPHIC	2	4.0%	10	20.0%
INDENTED	12	24.0%	19	38.0%
KELOID	0	.0%	3	6.0%
Total	50	100.0%	50	100.0%



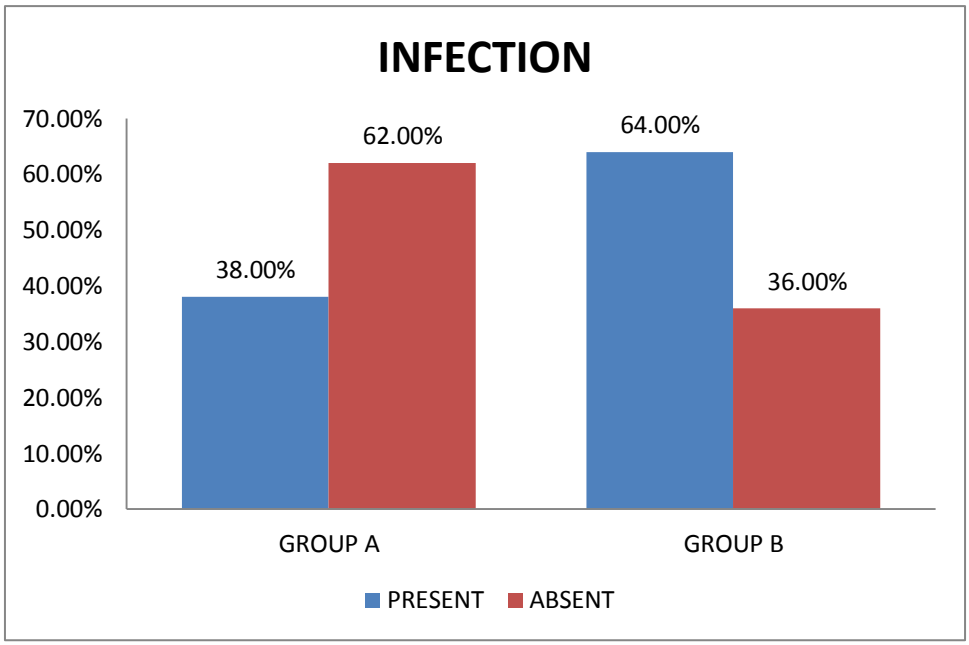
CHI-SQUARE TEST P VALUE =0.001($p<0.05$)

Scar was flushed with skin in72% and none of them had keloid in placental gel when compared to collagen gel group in which 18% of patients scar was flushed with skin and 6% had keloid. P value=0.001 shows significant statistical difference between the two groups

Table 9

INFECTION

INFECTION	GROUP A		GROUP B	
	NO	%	NO	%
PRESENT	19	38.0%	32	64.0%
ABSENT	31	62.0%	18	36.0%
TOTAL	50	100.0%	50	100.0%



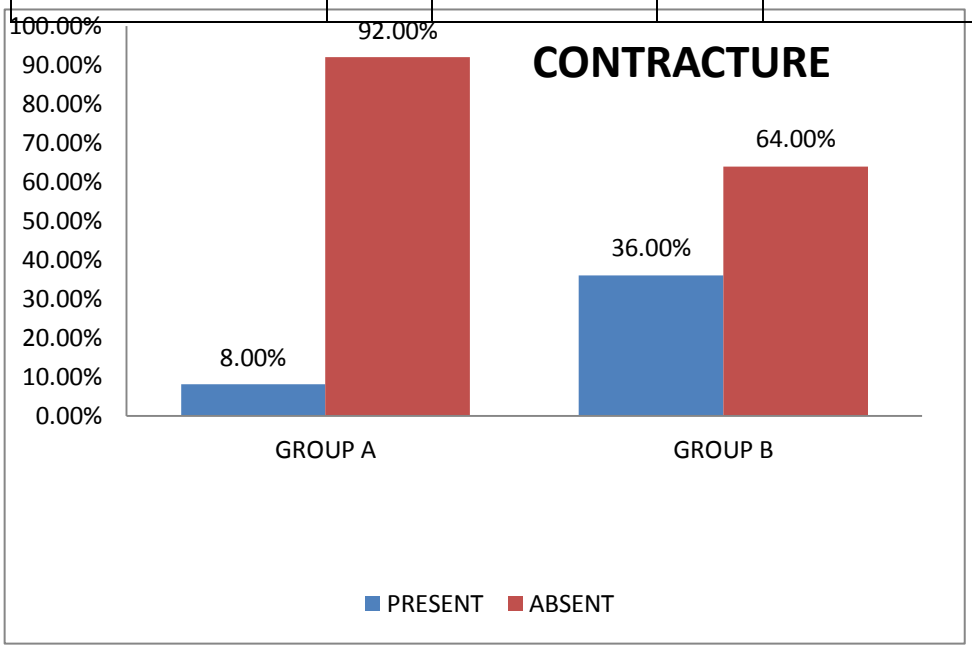
CHI-SQUARE TEST P VALUE =0.009 ($p<0.05$)

The rate of infection is low in placental gel when compared to collagen gel group. P value of 0.009 shows statistical significance.

TABLE 10

CONTRACTURE

CONTRACTURE	GROUP A		GROUP B	
	NO	%	NO	%
PRESENT	4	8.0%	18	36.0%
ABSENT	46	92.0%	32	64.0%
TOTAL	50	100.0%	50	100.0%



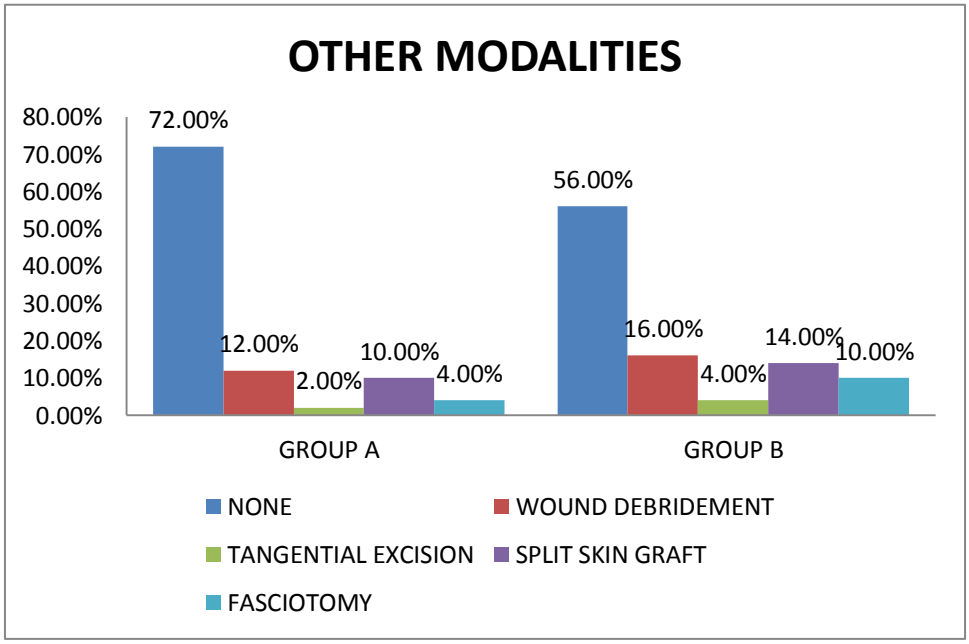
CHI-SQUARE TEST P VALUE =0.001($p<0.05$)

Contracture was present in 8% in placental gel group compared to 18% in collagen gel group p value of 0.001 shows statistical difference between the two groups

TABLE 11

OTHER MODALITIES OF TREATMENT

OTHER MODALITIES	GROUP A		GROUP B	
	NO	%	NO	%
NONE	36	72.0%	28	56.0%
WOUND DEBRIDEMENT	6	12.0%	8	16.0%
TANGENTIAL EXCISION	1	2.0%	2	4.0%
SPLIT SKIN GRAFT	5	10.0%	7	14.0%
FASCIOTOMY	2	4.0%	5	10.0%
Total	50	100.0%	50	100.0%



CHI-SQUARE TEST P VALUE =0.519(p>0.05)

Both groups required other modalities of treatment like fasciotomy, wound debridement etc.

Though the percentage of patients requiring other modalities were less in placental gel when compared to collagen group, since the p value is .519, the data is not statistically significant.

TABLE 12

VARIABLES	GROUP A		GROUP B		UNPAIRED T TEST P VALUE
	Mean	Standard Deviation	Mean	Standard Deviation	
DURATION OF STAY	14.46	4.59	18.78	4.36	<0.001
DURATION OF WOUND HEALING	19.86	4.04	24.18	4.00	<0.001

The mean duration of stay in Group A was 14 days when compared to 18 days in GroupB

The mean duration of wound healing in Group A was 19 days when compared to 24 days in Group B

P value of less than 0.001 shows statistical significance in that duration of wound healing and hospital stay is less in Group A(placental gel group).

DISCUSSION

Burn injuries produce coagulative necrosis of the skin and underlying tissues which is very painful and is associated with complex local and systemic complications and a high mortality.

Superficial burns i.e. First degree burns heal in 5-7 day time without any scarring. While superficial dermal or deep dermal burns i.e. 2nd degree burns take anytime between 2 to 4 weeks to heal and are extremely painful. Second degrees burns if not treated promptly and properly, may get infected & get converted into third degree i.e. Deep burns resulting in scarring & contracture formation.

Inspite of various advances in the treatment of burns and better understanding of pathophysiology and advent of various spectrum of antibiotics to prevent infection in burns, the 2nd to 3rd degree burns are still an enigma and challenge to the surgeons.

The morbidity and mortality in burns are still high. To decrease morbidity and mortality tangential / primary excision and grafting has become imperative in second and third degree burns. But the effort to prevent the progression of depth of burns, the relief of pain, the requirement of high quantities of intravenous fluid for resuscitation and use of appropriate antibiotics are still a daunting task for the surgeons.

Analysis of collected data and interpretation data in comparison to other studies:

A total of 100 patients were included in this study. Patients were categorised into Group A and Group B after initial resuscitation. Patients were then followed up as mentioned earlier.

There was no age and sex difference statistically between the two groups . It was observed that placental gel dressing caused significant amount of rapid re-epithelisation of burns wound i.e. less duration of wound healing than collagen dressing group. From the Statistical analysis it is concluded that median time taken for wound healing was 19 days in placental gel group over 24 days in the collagen dressing group. It is also proven that the mean hospital stay was 14 days in placental gel group when compared to 19 days in collagen gel group .The rate of infection is 38% in placental gel group as compared to 64% in collagen group.

A prospective study done by *Demling.et.al*[30] compared the efficacy of placental extract in chronic non- healing ulcers which showed the improved wound healing and lesser rates of need for skin cover procedures. In our study we have compared placental gel and collagen sheets which shows decreased duration of hospitalisation and duration of healing with improved cosmesis.

A study done by *gupta.et.el*[13] using collagen in burns proved its superiority over other conventional dressings like SSD etc.,. In my study have compared collagen with placental extract gel and according to my statistical studies it is

stated that there is a significant difference in placental gel being superior to collagen sheets in terms of better quality of scar, cosmesis, decreased infection rate, reduced number of days in hospital ,etc.

CONCLUSION

Placental extract is safe and effective for treating Burn patients over collagen sheets.

➢ Placental gel has been very well tolerated in burn patients

➢ Placental gel dressing improves the healing process of Burn wound when compared to collagen dressings.

➢ It minimises the duration of follow up and the usage of antibiotics

➢ Very much useful in second degree burns.

➢ It is cost effective when compared to collagen sheets.

SUMMARY

This was a prospective study done in Coimbatore Medical College Hospital between January 2018- December 2018 in which patients who met the inclusion criteria prior to the study were divided into two equal groups, Group 1 received Placental extract gel and Group 2 received collagen sheets.

The study included patients who have been admitted in this hospital within two days of burn injury.

- All the patients include in this study had second degree burns
- 50 were male patients and 50 were female patients
- Majority of the patients were in the age between 21 to 40 years.
- The most common percentage of burns involved were 25-40%
- Severity of pain was less in placental gel group
- The patients in placental gel group had better compliance
- Healing rates were faster with placental gel group
- Scar was better with placental gel group

APPENDIX 1

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APPENDIX 2

APPENDIX 3

ABBREVIATIONS

M- Male

F-Female

A-Accidental

Scl-scalds

Fl-flame burns

E-Electric burns

WD-Wound debridement

Fsc-Fasciotomy

Te-Tangential excision

SSG-Split skin graft

Inf-Infection

Sm-slight mismatch

Om-obvious mismatch

Gm-Gross mismatch

p-perfect

NT-Normal texture

JP-Just palpable

FT-Firm Texture

HT-Hard Texture

FC-Firm contour

IC-Indented contour

HC-Hard contour

k-keloid

APPENDIX 4

LIST OF TABLES AND FIGURES

CONSENT FORM

CASE PROFORMA

Name: DOA: Case No.

Age: DOD: IP No.

Sex: Group assigned:

Address Occupation:

Percentage of burns:

Degree of burns:

Nature of burns

Past history:

Personal history:

General examination:

Local examination :

Scar colour: Scar contour:

Scar texture:

Presence of infection:

Duration of stay:

Duration of healing:

S NO	NAME	AGE	SEX	BURNS PERCENT	DEGREE OF BURNS	TYPE OF BURNS	NATURE	SCAR_ COLOUR	SCAR_ TEXTURE	SCAR_ CONTOUR	INFECTION	CONTRACTURE	OTHER_ MODALITIES	DURATION_ STAY	DURATION_ WOUNDHEALING	GROUP
1	SUBASH	18	1	15	1	FLAME	ACCIDENTAL	3	4	1	2	2		8	15	1
2	DIVYA	22	2	10	2	FLAME	ACCIDENTAL	3	4	1	2	2		7	15	1
ss	VIJAYA	26	2	15	1	FLAME	ACCIDENTAL	3	4	1	2	2		8	15	1
4	SELVI	28	2	10	2	FLAME	ACCIDENTAL	3	4	1	2	2		7	15	1
5	CHINRAJ	40	1	20	1	FLAME	ACCIDENTAL	3	4	1	2	2		7	15	1
6	RANJINI	39	2	20-25	2	FLAME	ACCIDENTAL	3	4	1	2	2		12	18	1
7	CHINNAMAL	38	2	20-25	1	FLAME	ACCIDENTAL	3	4	1	2	2		10	15	1
8	PRABHU	17	1	20-25	2	FLAME	ACCIDENTAL	3	4	1	2	2		12	17	1
9	SATHYA	37	2	30-35	1	FLAME	ACCIDENTAL	4	4	1	1	2	WD	20	25	1
10	KANNAMAL	28	2	25-30	1	FLAME	ACCIDENTAL	3	4	1	2	2	WD	18	25	1
11	CHITHRA	29	2	25-30	2	FLAME	ACCIDENTAL	3	4	1	2	2		18	23	1
12	ISMAIL	31	1	30-35	2	FLAME	ACCIDENTAL	4	3	1	1	2	FSC	16	25	1
13	MALLIKA	33	2	35-40	2	FLAME	ACCIDENTAL	4	3	1	1	2	FSC	20	25	1
14	KUMAR	34	1	20-25	1	FLAME	ACCIDENTAL	3	4	1	2	2		15	19	1
15	SUMATHI	18	2	35-40	1	FLAME	ACCIDENTAL	4	3	1	1	2	WD	20	25	1
16	SANGEETHA	38	2	35-40	2	FLAME	ACCIDENTAL	2	3	3	1	1	TE	20	25	1
17	PERUMAL	26	1	30-35	1	FLAME	ACCIDENTAL	4	4	1	1	2	SSG	17	22	1
18	SAIRAM	31	1	25-30	2	FLAME	ACCIDENTAL	3	4	1	2	2		15	22	1
19	SREEHARI	19	1	30-35	1	FLAME	ACCIDENTAL	4	3	3	1	2		16	19	1
20	PREMA	29	2	20-25	1	FLAME	ACCIDENTAL	3	4	1	2	2		13	20	1
21	FRANCIS	27	1	35-40	2	FLAME	ACCIDENTAL	3	4	1	1	2	WD	20	17	1
22	SUGANYA	35	2	30-35	2	FLAME	ACCIDENTAL	3	4	1	1	2	SSG	18	25	1
23	ANANDHI	29	2	20-25	1	FLAME	ACCIDENTAL	3	4	1	2	2		14	23	1
24	DEEPA	42	2	30-35	1	FLAME	ACCIDENTAL	4	4	1	1	2		20	20	1
25	MARAN	48	1	35-40	1	FLAME	ACCIDENTAL	2	3	3	1	2		19	24	1
26	KOWSALYA	46	2	25-30	2	FLAME	ACCIDENTAL	3	4	1	2	2		13	23	1
27	GANESH	47	1	35-40	1	FLAME	ACCIDENTAL	2	1	3	2	2		18	17	1
28	PAPATHI	32	2	20-25	2	FLAME	ACCIDENTAL	3	4	1	1	2	WD	12	23	1
29	CHITHRA	48	2	35-40	1	FLAME	ACCIDENTAL	2	1	3	2	2		10	15	1
30	JEEVA	50	2	35-40	2	FLAME	ACCIDENTAL	2	1	3	1	1		20	15	1
31	MAHENDRAN	44	1	25-30	1	FLAME	ACCIDENTAL	3	4	1	1	2	SSG	20	25	1
32	KALAISELVI	38	2	25-30	2	FLAME	ACCIDENTAL	3	4	1	2	2		15	25	1
33	DOWLAT	47	1	20-25	1	FLAME	ACCIDENTAL	3	4	1	2	2		14	20	1
34	BABU	48	1	30-35	2	FLAME	ACCIDENTAL	4	3	3	2	2		12	17	1
35	SAJUDEEN	23	1	25-30	1	FLAME	ACCIDENTAL	3	4	1	1	2	SSG	18	18	1
36	KARTHI	18	1	35-40	2	FLAME	ACCIDENTAL	1	1	2	2	2	WD	20	25	1
37	PAVITHRA	44	2	30-35	1	FLAME	ACCIDENTAL	4	3	3	1	1		19	24	1
38	SANDHYA	42	2	35-40	2	FLAME	ACCIDENTAL	2	3	3	2	2		17	22	1

39	SATHYA	38	2	25-30	1	FLAME	ACCIDENTAL	4	3	3	1	2		18	23	1
40	SRINIVASAN	46	1	20-25	2	FLAME	ACCIDENTAL	3	4	1	2	2		13	21	1
41	VEERAMAL	43	2	30-35	1	FLAME	ACCIDENTAL	4	3	3	2	2		14	15	1
42	VELAN	50	1	35-40	2	FLAME	ACCIDENTAL	1	1	2	1	1	SSG	20	15	1
43	MADHESH	49	1	30-35	1	FLAME	ACCIDENTAL	4	3	3	1	2		19	25	1
44	RAGHAVAN	25	1	20-25	1	FLAME	ACCIDENTAL	3	4	1	2	2		12	23	1
45	NARASIMAN	44	1	20-25	2	FLAME	ACCIDENTAL	3	4	1	2	2		10	18	1
46	VINOTH	22	1	15	2	FLAME	ACCIDENTAL	3	4	1	2	2		8	15	1
47	VIGNESH	35	1	10	1	FLAME	ACCIDENTAL	3	4	1	2	2		7	15	1
48	KUMAR	35	1	15	2	FLAME	ACCIDENTAL	3	4	1	2	2		8	15	1
49	RANGANATHAN	41	1	10	1	FLAME	ACCIDENTAL	3	4	1	2	2		7	15	1
50	ILAYARAJA	46	1	15	2	FLAME	ACCIDENTAL	3	4	1	2	2		9	15	1
51	SATHYA	18	2	10	1	FLAME	ACCIDENTAL	3	4	1	2	2		10	15	2
52	RAGHAVAN	22	1	20-25	2	FLAME	ACCIDENTAL	4	3	1	2	2		12	17	2
53	SASIKALA	27	2	25-30	1	FLAME	ACCIDENTAL	2	3	3	2	1	SSG	22	26	2
54	MEENA	34	2	30-35	2	FLAME	ACCIDENTAL	2	3	3	1	2	WD	19	24	2
55	NAZEEM	21	1	15	1	FLAME	ACCIDENTAL	3	4	1	2	2		18	25	2
56	THANGAVEL	39	1	20-25	2	FLAME	ACCIDENTAL	1	1	4	1	1	SSG	21	27	2
57	MUNIRAJ	30	1	35-40	1	FLAME	ACCIDENTAL	2	3	3	1	1	FSC	24	29	2
58	SUDHA	44	2	25-30	2	FLAME	ACCIDENTAL	4	3	1	2	2		20	26	2
59	VINODHINI	45	2	10	1	FLAME	ACCIDENTAL	3	4	1	2	2		15	20	2
60	ABIRAMI	32	2	30-35	2	FLAME	ACCIDENTAL	1	1	2	1	1	TE	24	30	2
61	SUMA	29	2	20-25	1	FLAME	ACCIDENTAL	4	4	1	2	2		16	22	2
62	ISMAIL	15	1	35-40	2	FLAME	ACCIDENTAL	2	3	3	1	1	SSG	23	28	2
63	RAVI	22	1	25-30	1	FLAME	ACCIDENTAL	4	3	1	1	2		17	24	2
64	MURUGESAN	29	1	15	2	FLAME	ACCIDENTAL	2	3	3	2	2		14	20	2
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69	SHAKILA	25	2	30-35	1	FLAME	ACCIDENTAL	4	4	1	1	2	FSC	19	24	2
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75	MAHENDRAN	49	1	35-40	1	FLAME	ACCIDENTAL	2	3	3	1	2		15	21	2

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78	ANDAVAR	50	1	15	2	FLAME	ACCIDENTAL	3	4	1	2	2		20	26	2
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